IMPACT OF TELECOMMUNICATIONS ON REGIONAL ECONOMIC DEVELOPMENT

FINAL REPORT

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IMPACT OF TELECOMMUNICATIONS ON REGIONAL ECONOMIC DEVELOPMENT

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Committee for the Joint Study
of the Impact of Telecommunications
on Regional Economic Development

Submitted by: M.A. Farrow

EXECUTIVE SUMMARY

This Report Assesses the Regional Economic Effects of the Development of the Telecommunications Industry in Canada

This report presents the findings and results of an analysis of the Canadian telecommunications industry, the strategic importance of the industry and its services in Canada and its contribution to regional economic development over the period 1971 to 1985. The study examines historical data on economic performance and draws upon surveys of business users, equipment manufacturers and telephone service companies to assess the relative contribution of telecommunications at the national and provincial levels.

Growth of the Telecommunications Industry is Linked to Performance of the Service Sector and Has Exceeded That of the National Economy

During the study period of 1971 to 1985, both the carrier and manufacturing sub-sectors of the telecommunications industry recorded rates of growth in output well above the national average, as measured by Gross Domestic Product (GDP). The transition from a goods-producing to a services-producing economy boosted demand for telecommunications services and equipment which encompassed the latest technology.

At the national level, the period 1974 to 1984 was characterized by the two business cycles, 1974 to 1979 and 1980 to 1984. During both business cycles, the sectors leading economic growth were typically in the service sector, including utilities, finance, insurance and real estate, and community, business and personal services. By contrast, goods-producing sectors generally lagged behind the rate of national GDP growth. Provincial variations in growth are also evident, depending on the relative concentration and types of services-producing and goods-producing industries in the region.

The strong growth of Canada's service sector with its demands for telecommunications led to an overall 5.5% rate of growth in telecommunications services output over the period 1974 to 1984. Key factors which contributed to this strong growth included increasing demand for long distance service which grew at about 10% annually during 1974 to 1979, and major rural upgrading programs in Ontario, Quebec, Alberta, Saskatchewan and the North. Employment growth in the carrier sub-sector was relatively more rapid during the early to late 1970's when the telcos were expanding their network capacity and upgrading rural and long distance services. Slower economic growth nationally and regionally contributed to declines in telco employment in the 1980's.

The growth for the telecommunications equipment manufacturers was tied to the second business cycle during 1979 to 1984. Growth in GDP averaged 3.9% annually, compared to 0.6% during 1974 to 1979. Growth between 1979 and 1984 was driven by demand for digital technology and was accompanied by increasing employment and capital investment in the telecommunications manufacturing industry.

The carrier and manufacturing sub-sectors of the telecommunications industry are important contributors to the domestic economy accounting for 3.8% of GDP in 1985 compared to 3% in 1974. In 1985, the carriers had revenues of $10.6 billion and employed about 98,000 employees, while the manufacturing sector provided shipments valued at $3.8 billion and employed 52,000 in 1984.

Technology played an important role in the changing structure and growth of the telecommunications industry, largely as a result of the proliferation of computer and semi-conductor technology. Canadian manufacturers met the global challenge and have excelled in the areas of microwave, digital switches, satellite communications, and fibre optics.

The Telecommunications Industry Makes An Important Contribution to Regional Economies

Telecommunications carriers are based in all regions of Canada. With the exception of Saskatchewan, the contribution of telcos to provincial GDP in all provinces rose over the period 1974 to 1984. The telecommunications manufacturing industry is less dispersed on a regional basis, with the majority of manufacturing activities, including R&D, being concentrated in Central Canada.

The manufacturing industry is dominated by Northern Telecom, which is majority-owned by Bell Canada Enterprises which also owns the carrier Bell Canada. Other carriers which are integrated with manufacturing include B.C. Tel, which has a subsidiary AEL-Microtel, and Alberta Government Telephones, which has an ownership stake in NovAtel. Northern Telecom has manufacturing facilities throughout Canada except in British Columbia where B.C. Tel and Microtel are based. This geographic distribution of plants reflects telco preferences for suppliers of equipment with a regional presence. This has brought economic development benefits, particularly employment, to these provinces.

The carrier and manufacturing industry combined have brought significant regional economic benefits, as shown through a comparative assessment of the industry and other selected sectors nationally and in each region:

- For Canada as a whole over the period 1974 to 1984, the traditional resource-based and goods-producing sectors lagged in output growth compared to the services-producing sector. In 1974, key goods-producing sectors accounted for 43% of the economy, but declined by 5 percentage points to only 38% in 1984. Meanwhile, key services-producing sectors increased their share of national GDP from 49% in 1974 to 53% in 1984. Closely following this structural transition, the analysis shows that four out of five of the fastest growing sub-sectors are information-intensive businesses: services to business management, telecommunications carriers, finance, insurance and real estate, and printing and publishing. In this context, the telecommunications sector has grown consistently in spite of changes in the operating (i.e. economic and regulatory) environment.

- In the Atlantic Provinces, the telecommunications carrier industry's output, as measured by Gross Domestic Product, grew faster than key provincial industries which were predominantly goods-producing and based on regional resources, e.g., fishing, mining, food and beverages, etc. The rate of employment growth in the Atlantic Provinces telecommunications carrier industry, however, was below that of the same provincial industries, with the exception of Newfoundland's mining and Prince Edward Island's agricultural sectors.

- In Central Canada, both output and employment growth in the telecommunications carrier industry exceeded that of key sectors except in Ontario's finance, insurance and real estate sector. The key industries used for comparative purposes consisted of forestry, wood and paper, and mining in Quebec and transportation equipment, food and beverages, primary metals and finance, insurance and real estate in Ontario. Employment growth in Ontario's and Quebec's telecommunications manufacturing sectors suffered declines in the 1970s. However, Ontario's telecommunications manufacturing sector rebounded during the 1979 to 1984 period with employment growth exceeding that of the province's transportation equipment and primary metals sectors.

- In Western Canada, the telecommunications carrier industry's output also grew relatively faster than the resource-based sectors such as agriculture and forestry in Saskatchewan and British Columbia, respectively. But carriers' output fell behind the extraordinarily rapid increases in the mining, oil and gas sectors of Saskatchewan and Alberta. Employment also increased at a faster rate in the carrier industry than in most selected provincial industries, except Manitoba's transportation services sector and the mining sector in Alberta and British Columbia.

These growth patterns, both nationally and regionally, demonstrate the importance of services-producing industries to economic growth. The role of telecommunications in this development pattern is crucial. As infrastructure for the support of delivery of information products and services, the telecommunications carriage sector has begun to assume the same economic significance as transportation routes have for the movement of products for the resource and manufacturing industries. As demand for telecommunications services grows, it, in turn, stimulates growth in the manufacturing sector. The ability of the industry to respond to these demands determines the growth of the telecommunications sector as a whole, as well as its contribution to regional economic development. It has become a core sector of the economy which can generate positive linkages both backward to the suppliers and forward to industries which can expand through the use of its input.

The Contribution of the Telecommunications Manufacturing Sector to Regional Economic Development Depends upon the Maturity of the Industry and Export Sales Opportunities

Five urban centres were selected to examine the contribution and success factors essential to regional economic development stemming from telecommunications equipment manufacturing. The five centres included Montreal, Ottawa, Saskatoon, Calgary and Vancouver, and the contribution to regional economic development was based on the following criteria:

- The diversity and depth of firms in each urban centre, and the synergy and linkages between them and other suppliers and markets;

- The ability to generate sales outside of the region and, preferably, outside of Canada;

- The ability to generate continued growth in employment, either through expansion of existing firms or through the establishment of new firms; and

- The ability of local engineers and scientists, often employed at existing firms, to become successful entrepreneurs by establishing new small companies.

The assessment of the industry's contribution to regional development varies across the five cities, although, in each centre, the genesis of the telecommunications manufacturing industry can be attributed to spinoffs from firms or research activities of government and institutions.

The firms located in Montreal and Ottawa are serving communications needs across many industries and sectors rather than limiting themselves solely to telecommunications service companies. An expanding product line is further supported by the maturing of small to medium-sized firms. The absolute size of the telecommunications manufacturing industry in terms of both revenue and employment generation, and the availability of local entrepreneurs have been key for Montreal and Ottawa in reaching a mature stage of telecommunications industrial development.

The conscious efforts of federal and provincial funding to assist in establishing high-tech related industries such as telecommunications manufacturing in the Western Provinces have set a course for diversifying those provincial economies from their reliance on mining and agriculture. Although the local responses were relatively more supportive in Saskatoon than in Calgary (e.g., the faster absolute growth in smaller second-tier companies), both Western cities still lack a sufficient local supplier network to make their local industries self-sustaining.

A majority of the Vancouver firms rely on the export market to generate sales and employment. The smaller firms have grown significantly in the last five years, but their overall contribution to the local economy is more difficult to measure. About two-thirds of the companies interviewed are in the small category with fewer than 50 employees. Most important, the largest employer - Microtel - has gone through a 3-year corporate reorientation (1984 to 1986) which has dramatically reduced its presence in the domestic telecommunications market and, since 1982, its sales have been decreasing. The start-up rate of firms has dropped off in the 1980s, which, combined with the corporate reorientation of Microtel, has contributed to a slower momentum of growth for the Vancouver telecommunications manufacturing sector in recent years.

For the large companies, the ability to raise capital in the equity market reduces, to a large extent, the need for direct government grants for start-up. Many firms were established before such grants were even made available. Nonetheless, government supported contracts and tax credits for R&D expenditures are important in order to remain at the forefront of technology and to maintain the higher than average R&D spending required to sustain this growth industry. Smaller companies look not only for financial aid during start-up, but continuous government support through export financing, marketing assistance, government contracts, or simply as a credit reference.

Because of the relatively small size of the domestic telecommunications market and the dominance by a few large firms, most small to medium-sized companies are continually seeking export opportunities for growth. These firms believe that a market without preferential or captive suppliers - such as exists in the United States - and with liberalized terminal attachment throughout Canada are two elements that would generate further market expansion for them.

Telecommunications Carriers Are a Vital Component of Some Provincial Economies

The survey of telecommunications carriers was designed to assess the industry's performance and its effect on regional economic development. Factors assessed included economic conditions, regulatory environment, carrier equipment purchases and R&D spending.

The economies of the Atlantic Provinces, British Columbia, the Yukon, Alberta and Saskatchewan depended heavily upon the financial health of several natural resources. Over the 1982 to 1987 period, the annual volatility of demand for resource-based products (e.g., oil and gas, base metals, lumber, etc.) influenced the ability to attract capital investment. Slower growth of investment directly results in reduced start-up of new businesses, employment growth and housing activity. This has reduced the level of absolute growth in the carriers' customer base and the volume of traffic. For national carriers such as CNCP and Teleglobe, the long upturn in the national economy since 1982 has increased volumes and helped to offset the declines in telex and telegram demand due to technological advancements, such as facsimile transmissions.

None of the carriers, other than CNCP Telecommunications, reported a significant impact on general performance as a result of changes in the regulatory environment. Competitive services, such as the growth of the interconnect market permitted in some provinces, may have altered the approach to service marketing, but the carriers were able to successfully compete on price and service quality terms. Cases such as B.C. Tel's permitted rate discounts to counter United States-based long distance discount services, and AGT's arbitration committee decision on a toll revenue resettlement plan with edmonton telephones, were individual incidences where regulatory decisions have a somewhat larger effect on revenue.

Almost all carriers have a preference for Canadian-made equipment. Bell Canada has a written policy to source material needs from the territories where service is delivered, but also has a supply agreement with another BCE subsidiary, Northern Telecom. The second largest telco, B.C. Tel, buys through an estimates or request for proposal process and no specific advantage is given to AEL-Microtel. Both Bell and B.C. Tel are involved in front-end R&D through their respective research subsidiaries, but Bell is more involved in sponsoring academic or joint government research activities than is B.C. Tel. The Prairie telcos generally prefer to purchase equipment from manufacturers with a presence in the region since they are considered to be more responsive to the carriers' technical and maintenance requirements. This has the effect of stimulating regional economic development. Atlantic carriers are less likely to source their equipment purchases locally due to limited indigenous communications manufacturing in the region, but do prefer to buy Canadian. Most of the smaller carriers are involved in basic R&D only to a limited extent (e.g., funding Telecom Canada's projects), citing the lack of economies of scale and high front-end costs as the main restraining factors. Québec Tel serves as an exception, with a recent request by its provincial regulator to establish a $10 million R&D program.

The Canadian telecommunications carrier industry thus contributes to regional development in two major areas: first, as a major employer and income producer. The purchase of products and services within their territory by individual carriers and the salaries paid to their employees are a vital component of some provincial and regional economies. In some instances, the telco is among the largest employers within the region. Secondly, telecommunications constitutes an important part of regional economic infrastructure, particularly in relation to the growth and development of new information-based service industries. It is, however, a necessary but not a sufficient condition on its own, for economic development. Since total telecommunications costs usually account for a relatively small amount of the total operating budget, in general, the decision for business to locate within different regions is more dependent upon other factors. The carriers demonstrate their role in regional economic development through infrastructure investment to deliver high quality service in all parts of their service territory.

Businesses See High Quality Telecommunications Services as Essential, Although Small Businesses Lag Large Firms in their Use of Telecommunications Services

Through a telephone survey of small businesses combined with a series of regional focus groups involving larger Canadian businesses, the patterns of telecommunications services and equipment usage and their effect on business location, success and competition were assessed.

The survey of small businesses targeted those firms averaging less than 50 employees. Through both this survey and the focus groups, it was found that most telecommunications services are widely available in Canada, although there are exceptions, particularly in areas outside of the main urban centres. Canadian businesses use these services in varying degrees, but all consider local and long distance telephone service essential to their operations.

Among small businesses, the volume of long distance calls varies more by industry sector than on a regional basis, for example, the construction sector makes less use of long distance service than do mining, services and transportation, communications/utilities organizations. Nonetheless, regional variations are interesting: only 37% of calls by Yukon firms are inside the region, while 84% of calls by Quebec firms are within that province. Firm size is also a significant factor in the use of long distance services, with large firms making greater use of long distance.

Only half of the small businesses surveyed use computers. This is not surprising since about half of the businesses had 11 or fewer full-time employees. Of firms using data communications, almost three-quarters indicated that data communications were very important to their organization. Timeliness, cost, and data base access are important factors influencing usage.

Many small businesses indicated that usage will increase only modestly among these businesses, as several factors inhibit increased usage of data communications. These include the cost of service, budget restrictions on computer equipment, lack of technical expertise, and the lack of knowledge of the benefits of data communications. Larger businesses indicated a high degree of computerization and dependence on data communications. Businesses in the finance, insurance and real estate sectors which have national operations consider telecommunications essential to their operations for the timely flow of data and information.

From a regional economic development perspective, a key strategic issue assessed through the survey and focus groups was the impact of telecommunications on business success and location. For both large and small business users, telecommunications was perceived as a minor factor in determining location, as other factors such as client base, access to materials or labour, etc. are considerably more important. However, telecommunications were perceived as having a positive effect on productivity, business growth and overall profitability.

For most firms, telecommunications costs do not affect cost-effectiveness due to the relatively small amount of expenditures on telecommunications, but the large absolute size of telecommunications costs make these costs important to the firm. Telco responsiveness to business service needs was perceived as critical to many large businesses which depend heavily on telecommunications whether internally to their operations, or with clients and suppliers. Therefore, telecommunications costs and service availability have little effect on the location of "front room" operations of certain businesses which are determined by other factors such as the location of customers and suppliers. There is, however, potential impact upon the location of centralized "support" operations, such that the lack of availability of services in rural and remote areas may disadvantage some areas as a business location. Business also believes that increased competition could improve services, making telcos more responsive to customer needs.

Free Trade will Benefit Users, but Provide Increased Competition to Canadian Firms Providing Enhanced Services and Equipment

Since 1978, Canada has had a net trade surplus in telecommunications equipment. Over the period 1979 to 1985, exports grew at a 23% annual rate, while imports rose by 16% annually. By 1985, Canada's trade surplus in telecommunications equipment reached $603 million.

The United States is Canada's major export market as well as a key source of imports. Canadian companies have been able to benefit from U.S. regulatory decisions which liberalized terminal attachment and network interconnection beginning in the early 1970's and especially from the divestiture of AT&T operating companies in 1984. Canadian telecommunications equipment manufacturing firms using state-of-the-art technology such as Northern Telecom were able to establish themselves in the large switches market niche, while Mitel was able to do so in the small PBX switches market. Many smaller Canadian firms also participated in the export boom to the United states (as shown in the case studies) because of their product specialization.

Liberalization of trade with the United States under the Free Trade Agreement will reduce and ultimately eliminate tariffs. For Canada's equipment manufacturers, this may lower the price of Canadian products. Export sales will be determined by equipment demand of U.S. telcos and businesses as Canadian manufacturers have proven their capability of competing in the U.S. market.

The increased competition in the domestic market created by the Free Trade Agreement will affect both the telecommunications manufacturing and the services sector.

Firms have moved to purchase inputs from outside firms, rather than providing them "in-house". This is especially true in the service sector. This trend may reflect the fact that productivity growth related to producer specialization has reduced costs in the service sector faster than in secondary manufacturing, which will be attempting to catch up in order to meet the competition from U.S manufacturers.

Indeed, in some sense, it is becoming difficult to distinguish the manufactured goods from the "services" that are either embedded in the product or sold as support/maintenance package, particularly in telecommunications. In this world of growing complementarity between goods and services, access to low cost, state-of-the-art services, is a key to success in manufacturing. Thus, telecommunications is increasingly important as the delivery mechanism of specialized contracted-out services.

American firms providing telecommunications services can be expected to have cost advantages arising from established economies of scale, and to some extent from strong productivity growth in recent years. Canadian providers have an exchange rate advantage, but this may be only temporary, and may be offset by higher unit costs.

Canadian telecommunications manufacturing firms will, however, be provided the opportunity to realize scale economies by pursuing U.S. market opportunities. An important route to long term competitive advantage in world markets is through specialization in particular product lines, longer and volume discounts from suppliers. There is evidence that these economies of scale also extend to various services where new information technology creates scale-related cost reductions.

Most telecommunications manufacturing firms must contemplate substantial and risky changes. Exploitation of this option includes narrowing their product offerings to achieve scale economies, investing in new facilities and developing new customers in areas where they have not sold before. The objective of being the world class producer of one particular product, as is often the case of Canadian telecommunications producers, is a major risk if the chosen product does not have a large enough market. Canadian firms may therefore have to pursue a strategy of product diversification in the short term. In this way, they will be competitive in both the U.S. and Canadian markets.

In Summary, Telecommunications is a Necessary, but not a Sufficient Condition for Regional Economic Development

Quality telecommunications services are essential for the operation of Canadian businesses. The future growth of the services sector of the economy is expected to enhance the absolute growth of the telecommunications industry. This growth will not necessarily result in increased employment due to the continued efforts by telecommunications carriers to increase productivity through technology, as well as rising economies of scale in service delivery. The process of specializing and building greater economies of scale will act to constrain the benefits that may be filtered through to provincial/territorial economies. The pursuit of technological excellence and advancement by the carriers also lays the foundation to stimulate growth in the Canadian telecommunications manufacturing industry. As further support to the domestic telecommunications manufacturers, the full adoption of free trade with the United States will guarantee unfettered entry to the most important customer for Canadian-made equipment. These opportunities abroad will not be limited to the established large manufacturers, they will also be available to Canadian entrepreneurs and will depend on their ability to exploit niche markets for telecommunications equipment. At the same time, it will make the domestic market more competitive due to the increased access for U.S. telecommunications equipment manufacturers.

The concerns of Canadian businesses over the limited service offerings outside the main urban centres are expected to be addressed, to a limited extent and at a gradual pace, through the stated investment plans of the carriers to upgrade basic services. The service gap between urban and certain rural locations can be expected to remain as competition and demands from large users and in high traffic areas continue to exert pressures on telcos to invest in new technologies, which may not prove cost-effective outside major urban centres. Business establishments are currently situated in their present locales because of factors other than the availability of telecommunications services, such as the local economic base, proximity to customers, concentration of population, etc. To the extent that this study has demonstrated that the telecommunications industry, in itself, is a necessary but not a sufficient condition for regional economic development, the decisions to locate outside of large urban centres are unlikely to be critically affected in a positive sense, by the availability of effective telecommunications systems and services. Their lack of availability, particularly given the current trend toward technological integration of computing and telecommunications, however, could adversely affect some location decisions.

DEPARTMENT OF COMMUNICATIONS

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1.0 INTRODUCTION

This report presents the findings of an analysis of the Canadian telecommunications industry and its contribution to regional economic development. This study is one of the initiatives taken by the federal government in co-operation with the provincial and territorial governments to improve the understanding of the economic role and strategic importance of the Canadian telecommunications industry and its services and the impact of this sector on regional economic development. (Regions are defined as multi-provincial, e.g. Atlantic rather than sub-provincial.) The study was undertaken with the support and financial assistance of the federal government department, Communications Canada (Telecommunications Policy Branch), and the provincial and territorial governments. While the report has been reviewed on behalf of all the governments, any publication that may be authorized does not signify that the contents reflect the views or policies of any of the governments involved. Also, any reference to trade names, commercial products or companies in the report does not constitute an endorsement thereof by any of the governments.

The purpose of this study was to provide a comprehensive review which quantifies, in detail, the role of various aspects of the Canadian telecommunications industry in economic and regional development, both directly, as a source of investment and employment, and indirectly, as an industrial infrastructure. The study therefore has a three-part focus:

- on the historical economic performance of the telecommunications industry itself and as compared to selected national and provincial/territorial industries;
- on the importance of telecommunications services as infrastructural support for business; and
- on the contribution to regional economic development by the telecommunications carriers companies and telecommunications equipment manufacturing firms.

For the purpose of this study, the telecommunications industry has been defined to include:

- telecommunications carriers and those companies providing "enhanced services";
- companies engaged in telecommunications equipment manufacturing, sales and service; and
- companies engaged in telecommunications consultation, research and development.

1.1 Objectives

The objectives and analytical framework of the project were to provide a base of economic information and analysis to assist Ministers in:

- developing telecommunications policies;
- promoting effective economic development in all regions of Canada; and
- assessing the prospects of enhanced trade in the telecommunications sector.

These objectives were expanded, as follows, to provide a basis for project methodology and the construction of individual work modules:

- To compare and describe historical patterns and trends of economic activity in the telecommunications sector, with particular emphasis on:
    - the structure of the industry in Canada;
    - industrial output (gross domestic product and operating revenues);
    - capital investment (including plant, materials and equipment);
    - employment;
    - productivity performance;
    - research and development (R&D)
    - demand for Canadian goods and services;
    - international trade in telecommunications equipment; and
    - major environmental factors (including technological innovation and regulatory policies).
- To compare the economic performance of the telecommunications industry to key national and provincial industries over the last decade.
- To carry out a structured survey of a statistically representative sample of companies in Canada and identify their expenditures on telecommunications services.
- To identify and describe the impact of the telecommunications industry as an infrastructure to support small, medium and large-sized companies.
- To examine the genesis and linkages and synergy of the telecommunications industry with other technologically-advanced industries in five urban high-tech pockets of telecommunications manufacturing activities.

- To assess the strategic importance of the telecommunications industry at the national, provincial and territorial levels in enhancing economic and employment growth on a regional basis.

The specific approaches and methodologies used to fulfill these objectives are detailed in the next section.

2.0 APPROACH AND METHODOLOGY

The analysis of the impact of telecommunications on regional development was divided into six work modules based on the detailed project objectives.

In this, the Final Report, the key material and findings from each of the work modules have been synthesized in order to draw conclusions and identify policy implications for enhancing regional development through the telecommunications industry.

The specific objectives and methodologies of each of the six work modules are summarized in the following sections in order to provide the reader with an understanding of how the overall study was conducted.

2.1 Historical Trends in Telecommunications

Work Module 1 assessed the pattern of growth of the Canadian telecommunications industry from 1971 to 1985, profiled the structure of the industry, analyzed its economic performance, surveyed the demand for equipment, and identified the impact of technological innovation and regulatory policies on the industry. Its purpose was to provide a background document on the industry and its development, from both a national and regional perspective.

The key economic indicators which were studied included output - Gross Domestic Product (GDP) - employment, capital investment, profitability, productivity performance, R&D expenditures and international trade in telecommunications equipment.

The telecommunications carriers and equipment manufacturing industries were defined using Statistics Canada's Standard Industrial Classification of 1980. Broadly speaking, the telecommunications carriers included telephone, telegraph, overseas cable and satellite companies, but excluded cable television. The equipment manufacturers included telecommunications equipment, electronic parts and components and other communications and electronic equipment suppliers.

Key economic and financial data on the industry were obtained from Statistics Canada, the Department of Regional and Industrial Expansion, the Department of Communications, and company annual reports for the period 1971 to 1985.

Supplementary research material, particularly in the assessment of environmental factors, was assembled using government reports, academic studies and other consultant project reports. Some major publications employed in the study included:

- Federal-Provincial Examination of Telecommunications Pricing and the Universal Availability of Affordable Telephone Service (a joint study by the federal government and the provinces, chaired by J.P. Mongeau, 1986).

- Telecommunications Policy and Regulation: The Impact of Competition and Technological Change (The Institute for Research on Public Policy: 1986).
- Study of Employment in the Communications Industry for the Ontario Ministry of Transportation and Communications (D.A. Ford & Associates: 1986).
- Canadian Developments in Telecommunications: An Overview of Significant Contributions (T.L. McPhail and D.C. Coll: 1986).

2.2 Comparative Analysis: Telecommunications and Other Key Economic Sectors

The second Work Module provided a comprehensive analysis of industry information to ascertain the level of economic activity which is directly associated with the provision of telecommunications services and to study the relative economic performance of the telecommunications industry against other key sectors of the economy. Key sectors of the economy were selected, and comparisons of their economic performance from 1974 to 1984 were made with the telecommunications carriers and equipment manufacturing industries, at both the national and provincial levels.

At the national level, eighteen key industry sectors were selected for comparative analysis. These were:

- Agriculture
- Wood, Paper and Forestry
- Mining and Petroleum
- Manufacturing
- Food and Beverages
- Printing and Publishing
- Construction
- Transportation
- Broadcasting
- Electrical Power, Gas and Other Utilities
- Wholesale Trade
- Finance, Insurance and Real Estate
- Services to Business Management
- Data Processing
- Government
- Defense
- Accommodation and Food Services
- Education and Health Services

Key economic indicators, such as growth in real output as measured by GDP, employment, capital investment, profitability, and productivity were assessed for each of the above sectors, except data processing, which is subsumed in the services to business management category.

The analysis compared average annual compound growth rates in constant dollar terms for each indicator for two five-year periods - 1974 to 1979, and 1979 to 1984 - as well as over the entire time period, 1974 to 1984. Each industrial sector was further grouped into one of three growth categories: higher than the national average growth rate (based on GDP performance); coincident with the national average growth rate; and below the national average. The analysis focused on factors contributing to the level of performance of each sector and how the performance of each selected sector compared with the telecommunications sector.

The methodology at the provincial level was similar to that used at the national level. Due to data limitations, two indicators of growth, output and employment, in the telecommunications sector were compared to the performance of the selected provincial and territorial industrial sectors.

2.3 Telecommunications User Survey of Small and Medium-sized Business

Work Module 3 used a survey to gauge the importance of telecommunications to small and medium-sized business, defined as those firms with up to 500 employees. Canadian businesses representing all economic sectors and provinces and territories were included in the survey. The questionnaire included factors such as voice and data transmission, the level of use of different services and equipment, and the impact of telecommunications on variables such as business success, location and competitiveness.

The survey was conducted using telephone interviews during April, 1987. The questionnaire, which was available in both English and French, was based on a set of research questions developed in conjunction with the Telecommunications and Regional Economic Development Study Steering Committee (Appendices II and III).

A stratified random sample of firms was used in the survey. The sample quotas were designed to give equal weighting to each of the ten provinces and the two territories. Within each geographical area, equal weighting was given to each industry sector. A slightly greater number of organizations were selected in Ontario and Quebec to reflect the greater level of economic activity in those provinces. In accordance with the Federal Treasury Board's requirements, the sample design and methodology was reviewed and approved by Statistics Canada.

From an initial sample of some 1,800 firms, nearly 1,200 firms were contacted and 654 interviews were completed, giving a 55% completion rate. In order to accurately reflect a universe of small and medium-sized firms during the analysis, a small percentage of very large firms (employing more than 500 employees) were deleted from the study. This reduced the sample size from 654 to 592. The realized sample was more heavily concentrated in the services (16.7%), retail (14.4%) and manufacturing (11.3%) sectors, with somewhat less representation provided by organizations in the mining (5.2%), wholesale (6.4%) and finance/insurance/real estate (7.1%) sectors.

Because of the dilution in the sample, the survey results relating to specific cells, on small areas, required careful and informed interpretation. The results of the small-area data were both interesting and useful, and the results of user workshops (Work Module 4), were used to supplement the interpretation of the data and the implications for business.

2.4 Large Business User Workshops

Work Module 4 consisted of a series of 11 workshops conducted with major telecommunications users in the business sectors. The workshops focused on the importance of telecommunications services, their availability, and their impact on business operations. The objective was to gain insights into the telecommunications needs of these major users and to gather information regarding the effects on business profitability, location, market sphere, and competitiveness of telecommunications services. In particular, the workshops focused on issues of location and the provision of telecommunications services.

Since the survey of the third Work Module (see 2.3) was designed to assess the regional economic impact of telecommunications on the small and medium-sized businesses which are comparatively small users, the workshops were used to collect similar information from the larger firms and users. Workshops, rather than telephone interviews, were a more appropriate method of collecting information from the large users given the complexity of such organizations. Participants of the workshops were selected from large organizations representing key industrial sectors in each province/territory. The names of participants were generated by the consultant and supplemented by the provincial/territorial governments. In the case of some organizations, the telecommunications managers were invited to attend, while in other organizations, owners/office managers were asked to participate.

One workshop was held in each province and territory except for the Yukon, for a total of 11 workshops. The workshops were held in leading commercial centres, selected by each government. All the workshops were moderated by professional staff of The Coopers & Lybrand Consulting Group. Provincial/territorial government officials and Communications Canada regional representatives also attended the workshops.

The agenda for the workshops paralleled the topics explored in the telephone survey. However, considerable latitude was allowed in terms of expressions of different regional concerns at each workshop.

2.5 Case Studies of Telecommunications Manufacturing and R&D in Five Selected Urban Centres

Work Module 5 involved case studies of five selected Canadian urban centres: Montreal, Ottawa, Saskatoon, Calgary and Vancouver. The objective of each case study was to develop an understanding of the genesis and development of the telecom manufacturing sector in each centre, to assess the economic role the process has played in the respective region, and its contribution to regional development.

A sample of telecommunications manufacturing companies was selected from names listed in the Statistics Canada publication "Communications and Other Electronic Industries", (Catalogue No. 43-206). This list was further supplemented with names from relevant trade and industry association directories.

Data were gathered using telephone interviews with senior executives of telecommunications manufacturing and related companies. Information was solicited on the effects of telecommunications on the choice of location, the level and effectiveness of government research and development assistance, perceived changes in the business and regulatory environment and their effects on business, and anticipated medium-term growth targets. This information was used to analyze the key factors which influence the companies' location, their relationship with suppliers and markets, and the impact which the telecommunications manufacturing and related industries have in terms of economic development in five regional centres.

The product lines of the targeted companies offer a wide spectrum of telecommunications and related products, including:

- PBXs of all sizes
- key telephone systems
- transmission equipment
- videotex equipment
- satellite telecommunication services and components manufacturing
- standards consulting
- earth stations
- military communications equipment
- local area networks software
- packet radios
- fibre-optic cables and accessories
- cellular mobile telephones
- telephone refurbishing
- telecommunications networks and systems consulting, and
- contract research

In addition to the survey of manufacturers and related industries, local economic development authorities were contacted to complement the information gathered from individual companies. The questions to the development authorities focused on the efforts and effectiveness of policy measures that were made in promoting the establishment of high-tech industries in the area.

2.6 Telecommunications Carriers Company Discussions

Work Module 6 measured the economic impact of the operations of regional telecommunications carriers, their equipment purchase practices, level of external R&D activities and their plans for investment in the 1987 to 1990 period. The objective was to examine the strategic contribution of the Canadian telecommunications carriage industry to regional economic development.

Eighteen telecommunications carriers were identified by the consultants which, collectively, represent about 95% of the telecommunications carriage activities in Canada. These companies include the regional telcos, independent telcos, telegraph, and overseas satellite communications firms.

The members of the Steering Committee provided many personnel contacts with provincial telcos and other carriers for interview purposes. The consultants supplemented the above by identifying additional personnel through their own contacts. Telephone discussions were carried out with targeted executives. Sixteen of the eighteen targeted firms of the original sample participated in the survey.

2.7 Structure of the Report

The report synthesizes the information and analyses conducted for each of the six Work Modules to bring together the data and assessment for policy discussion purposes.

Chapter 3 provides the historical context. It examines the performance of the telecommunications industry based on key economic indicators. This performance is compared to that of the economy as a whole, and the service-producing and goods-producing sectors and sub-sectors within each. Comparisons at the provincial level are also made.

Factors which have influenced the growth of the two sub-sectors, carriers and manufacturing, over the study period including regulatory changes, both in Canada and the United States, are also reviewed. Chapter 4 assesses the importance of telecommunications to Canadian business, focusing on current and projected usage of services and equipment. Of particular concern to this study is the impact of telecommunications to business success, location and competitiveness as perceived by business.

Chapter 5 provides a synthesis of the key findings across all Work Modules about the contribution of both telecommunications carriers and manufacturing to regional economic development. This stems from their operations, as well as, in the case of carriers, from the level and quality of services associated with the telecommunications infrastructure.

Finally, Chapter 6 presents the key conclusions arising from the study.

TABLE 3.1

Gross Domestic Product by Industry
Selected Years 1974, 1979, 1984
Constant 1971 $ Millions

Industries	1974	% of Total GDP	1979	% of Total GDP	1984	% of Total GDP	Compound Annual Rate Of Change (%) 1974-1979	Compound Annual Rate Of Change (%) 1979-1984	Compound Annual Rate Of Change (%) 1974-1984
Canada Total	99,347.2	100.0	116,295.9	100.0	124,855.5	100.0	3.2	1.4	2.3
Telecommunications Carriers	2,412.1	2.4	3,439.7	3.0	4,112.7	3.3	7.4	3.6	5.5
Telephone Systems	2,200.6	2.2	3,168.3	2.8	3,826.1	3.1	7.6	3.8	5.7
Telegraph & Cable	211.5	0.2	271.4	0.2	286.6	0.2	5.1	1.1	3.1
Telecommunications Equipment Manufacturers	551.8	0.6	567.9	0.5	686.6	0.5	0.6	3.9	2.2
Finance, Insurance and Real Estate	11,593.0	11.7	14,768.5	12.7	16,871.0	13.5	5.0	2.7	3.8
Wholesale Trade	5,340.4	5.4	6,359.4	5.5	7,171.2	5.7	3.6	2.4	3.0
Services to Business Management	2,810.7	2.8	4,131.8	3.6	5,184.9	4.2	8.0	4.6	6.3
Education and Health Services	10,553.9	10.6	11,593.0	10.0	12,910.5	10.3	1.9	2.2	2.0
Broadcasting	403.6	0.4	565.4	0.5	651.1	0.5	7.0	2.9	4.9
Accommodation and Food Services	2,620.4	2.6	3,102.9	2.7	3,021.6	2.4	3.4	-0.5	1.4
Construction	6,446.3	6.5	7,108.6	6.1	6,210.9	5.0	2.0	-2.7	-0.4
Agriculture	2,412.6	2.4	2,702.8	2.3	3,102.6	2.5	2.3	2.8	2.5
Wood, Paper and Forestry	3,676.6	3.7	4,060.1	3.5	4,140.9	3.3	2.0	0.4	1.2
Electric Power, Gas and Utilities	2,853.3	2.9	3,692.6	3.2	4,395.4	3.5	5.3	3.5	4.4
Transportation	6,313.0	6.4	7,487.7	6.4	8,114.9	6.5	3.5	1.6	2.5
Mining and Petroleum	3,586.9	3.6	3,347.9	2.9	3,473.6	2.8	-1.4	0.7	-0.3
Manufacturing	23,497.2	23.7	26,587.7	22.9	26,389.6	21.1	2.5	-0.1	1.2
Data Processing	N/A	-	N/A	-	N/A	-	-	-	-
Printing and Publishing	1,153.5	1.2	1,438.3	1.2	1,700.1	1.4	4.5	3.4	4.0
Food and Beverages	2,835.9	2.9	3,158.1	2.7	3,223.7	2.6	2.2	0.4	1.3
Government	5,888.4	5.9	6,725.2	5.8	7,483.6	6.0	2.7	2.2	2.4
Defense	1,117.6	1.1	1,161.5	1.0	1,169.7	0.9	0.8	0.1	0.5
All Other*	3,280.0	3.3	4,296.8	3.7	4,840.9	3.9	5.5	2.4	4.0

*Includes categories not of direct interest to this study, such as Fishing and Trapping and Storage.

N/A - Not available.

Source: Statistics Canada, Gross Domestic Product by Industry, 1984, Cat. No. 61-213.

3.0 HISTORICAL PERFORMANCE OF THE TELECOMMUNICATIONS INDUSTRY

This section of the report provides a macroeconomic assessment of the performance of the Canadian economy between 1974 and 1984. It also discusses how the key sectors of the economy have been affected by the changing economic structure over the decade with the increasing importance of the service sector relative to the goods-producing sector. The contribution of each sector to GDP over the period is shown in Table 3.1. Finally, it presents a comparative economic analysis of the telecommunications industry, including the carriers and equipment manufacturing sub-sectors, to the selected key sectors on both a national and provincial basis.

This overview of the Canadian economy and the changes during the study period since 1971, set the context for the assessment of the performance of the telecommunications industry. Key factors which have influenced its performance are also assessed to show the role of the changing regulatory environment, both domestically and abroad, the effect of technology and the purchasing practices of the telcos.

3.1 Telecommunications is a Leading Growth Sector With Its Performance Linked to That of the Service Sector

3.1.1 Overall Economic Performance (1974 to 1979)

The 1974 to 1975 Downturn

Following the first OPEC oil price shock in 1973-74, total constant dollar (i.e. net of inflation) output in the industrialized countries declined while inflation and unemployment rates rose rapidly. Canada, however, was cushioned - at least temporarily - against some of this oil price shock by its domestic energy resource base which resulted in a milder recession in comparison. The major source of weakness in the economy was in exports. Residential construction also declined, but spending by consumers, governments and business continued at a fairly strong pace, and inventory accumulation also helped to offset some of the weaknesses in the economy.

By late 1975, wage demands had mounted to over 20% per year as Canadians reacted to what, by then, had become a domestic inflation problem. The government responded with price and wage controls and a period of monetary and fiscal restraint.

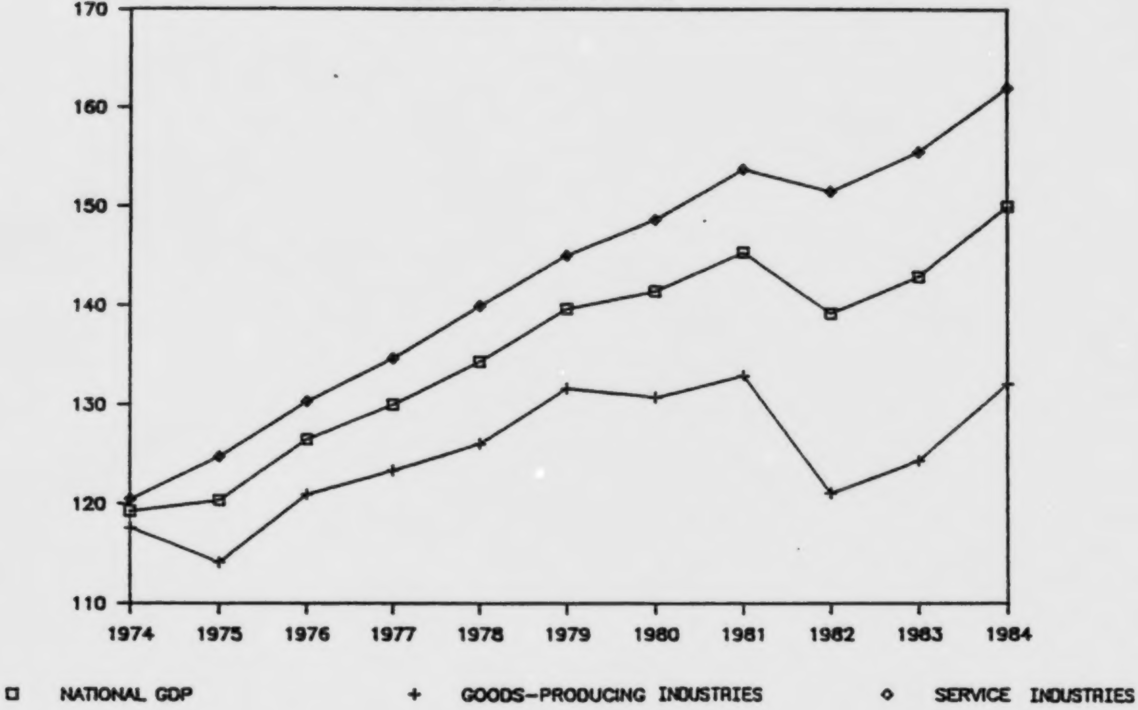
The 1976 to 1979 Expansion

Despite this restraint, Canada's economy moved ahead in 1976. The consumer sector and export demand led the advance over the next several years. However, government spending, business investment and inventory build-up slowed considerably which resulted in a modest 3.5% rate of increase in aggregate demand overall. By 1979, the economic upswing reached a mature phase. As final demand from consumers, governments and foreigners slowed significantly, inventories began to accumulate and business investment plunged. Residential construction further weakened aggregate demand.

FIGURE 3.1

NATIONAL GDP vs. GOODS-PRODUCING AND SERVICE INDUSTRIES' GDP

CONSTANT $ INDEX 1971=100



SOURCE: Statistics Canada, Gross Domestic Product by Industry, Cat. No. 61-213.

Note: For Figures 3.1 to 3.7, we present the GDP data in index form, with 1971=100. The index is read against the left axis. This method facilitates the comparison of the change in output of each sector.

The 1976 to 1979 expansion, however, did not exceed in any sustained manner, the long-term potential growth rate. The economy operated below the average level of capacity utilization recorded in the postwar period. This expansionary cycle was also characterized by major structural shifts in terms of the relative contribution of specific sectors to total economic growth (Table 3.1) in the economies of Canada and the United States in response to oil price changes and the emergence of new manufacturing centres in the developing world.

Resource-based industries (base metals, paper and newsprint) were reaching capacity production in 1979, but industries such as autos, construction and the government sector experienced a significant degree of slack and, once again, inflation became a major problem.

a. The Leading Industries

The leading sectors were typically the service industries, reflecting the general trend in the economy as growth in the goods-producing industries was largely less buoyant. Figure 3.1 shows the growth of total Canadian GDP and the two sub-sectors of goods and services based on an index where GDP=100 in 1971. Canadian GDP grew at a 3.2% real annual rate in this period. The industries which are categorized as "leading" surpassed this rate of growth, averaging between 3.4% and 8.0% from 1974 to 1979. These industries, predominantly in the service sector, were: telecommunications carriers; services to business management; broadcasting; finance, insurance and real estate; printing and publishing; transportation services; electric and gas utilities; wholesale trade; and accommodation and food services.

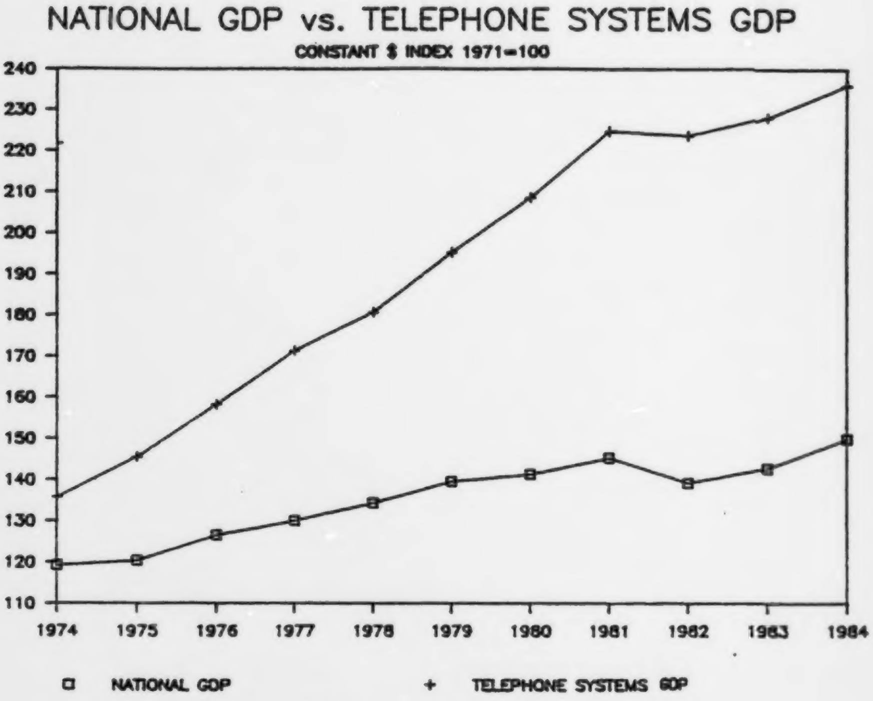
Telecommunications Services and Telecommunications Equipment Manufacturing

Surging demand for telephone services, particularly in long distance calls, combined with rural services improvement and expansion programs provided the stimulus to large gains in output of the telecommunications carriers sector, averaging 7.4% annually. Figure 3.2 shows the output performances of the telcos against total national GDP using an index to show the relative growth. Total construction expenditures by the telecommunications industry, however, were relatively constant, while employment rose substantially by a total of 17% between 1974 and 1979 in the carrier sub-sector due to growth in service demand. During this period, however, telecommunications manufacturing output performed below average, particularly between 1974 and 1978 (Figure 3.3). Revenue growth was sluggish prior to the introduction of major changes in technology (e.g. digital central office switches (PBXs) and satellites).

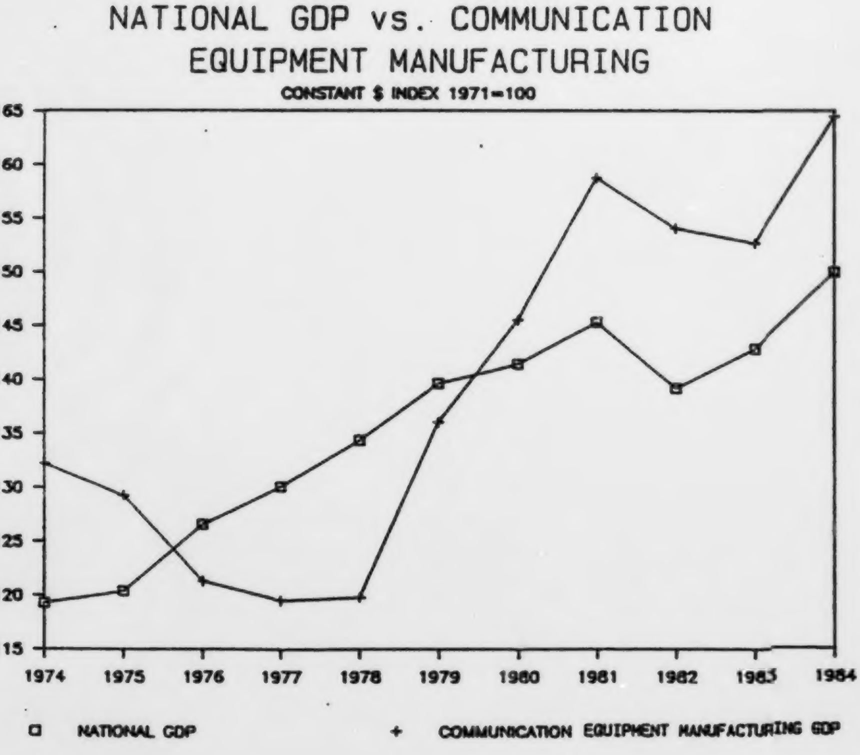
Utilities

Three factors in the electric power industry allowed this industry, which includes natural gas and other utilities, to record a 5.3% annual constant

FIGURES 3.2 AND 3.3


NATIONAL GDP vs. TELEPHONE SYSTEMS GDP

CONSTANT $ INDEX 1971=100


NATIONAL GDP vs. COMMUNICATION EQUIPMENT MANUFACTURING

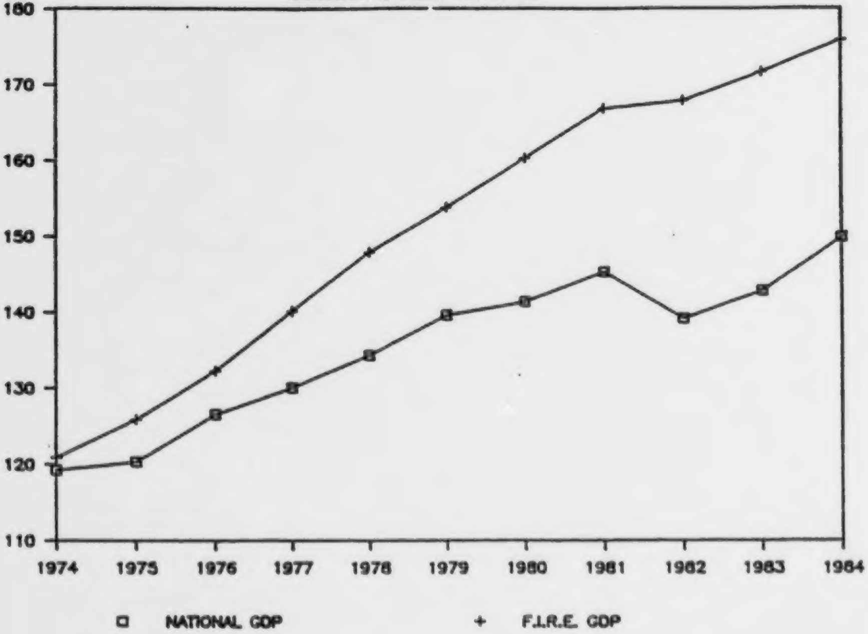
CONSTANT $ INDEX 1971=100

SOURCE: Statistics Canada, Gross Domestic Product by Industry, Cat. No. 61-213.

FIGURES 3.4 AND 3.5

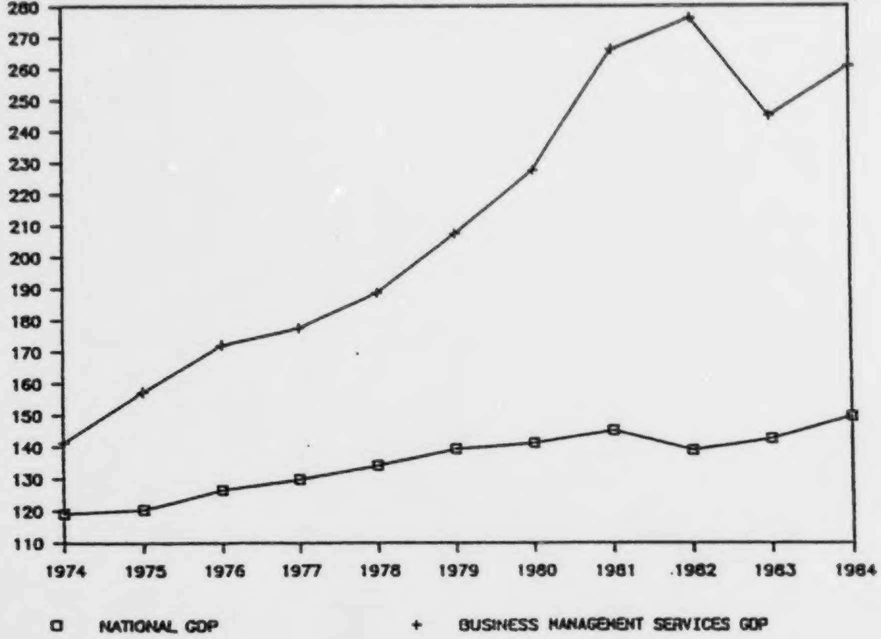
NATIONAL GDP vs. FINANCE, INSURANCE AND REAL ESTATE GDP

CONSTANT $ INDEX 1971=100



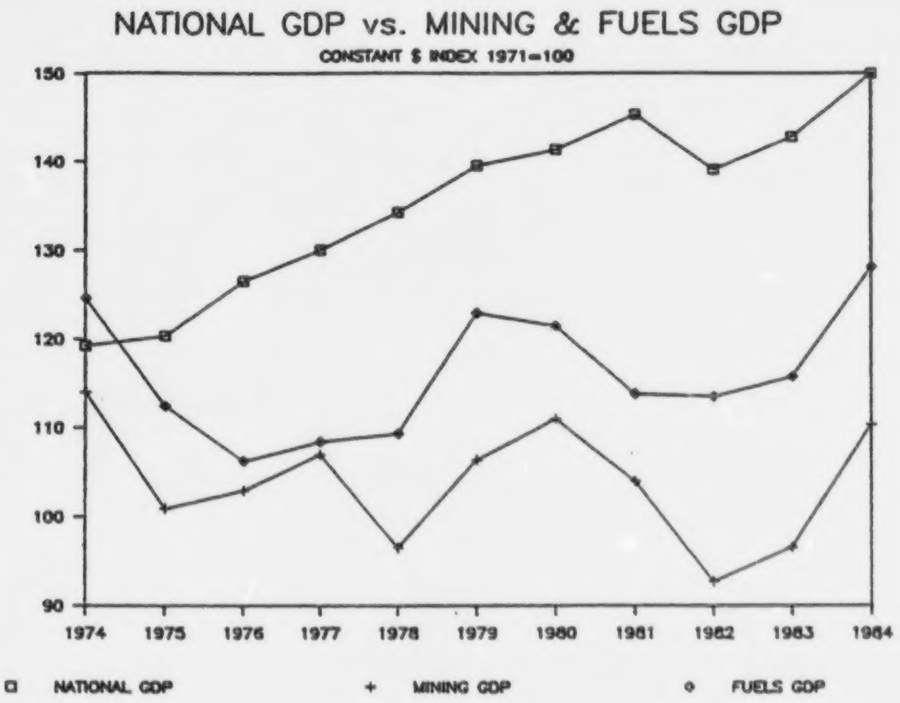
NATIONAL GDP vs. SERVICES TO BUSINESS MANAGEMENT

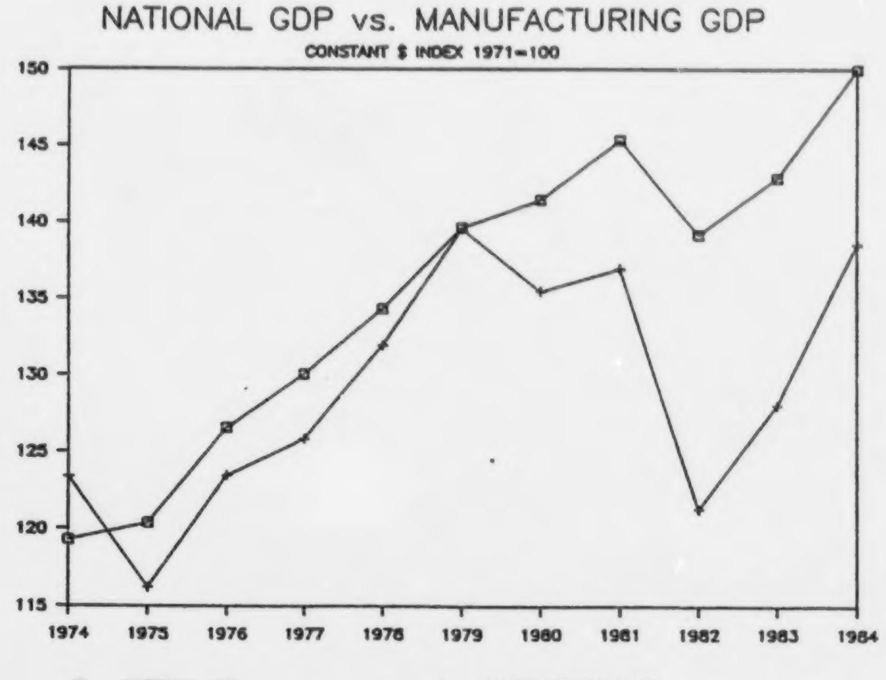
CONSTANT $ INDEX 1971=100



SOURCE: Statistics Canada, Gross Domestic Product
by Industry, Cat. No. 61-213.

FIGURES 3.6 AND 3.7





SOURCE: Statistics Canada, Gross Domestic Product by Industry, Cat. No. 61-213.

dollar growth rate: completion of Churchill Falls, Newfoundland, James Bay and Quebec hydro-electric projects; increasing interconnection of power grids interprovincially and internationally; and rising United States' energy demand by 1979 which was stimulated by the global energy shock.

Finance, Insurance and Real Estate

This sector experienced strong growth of 5.0% annually as savings rates increased and demand rose for mortgages and real estate services, particularly in the real estate resale market (Figure 3.4).

Community, Business and Personal Services

The strongest growing components were services to business management of 8.0% per annum (led by computer services), and accommodation and food services at 3.4% per annum (in response to increased travel and dining out) (Figure 3.5).

b. The Lagging Industries

The goods-producing industries - including the resource sector, manufacturing, and construction - were faced with volatility in business activities. Overall growth for these industries was below the 3.2% annual rate of increase in Canadian GDP.

Forestry

The forestry sector exhibited strong cyclical fluctuations with an early downturn during the 1974 to 1975 recession, and recorded only a 2.0% annual rate of increase in sectoral GDP. Recovery in later years was spurred by the depreciation of the Canadian dollar. Nonetheless, the total share of domestic output and employment fell, with only moderate growth occurring in gross fixed capital formation.

Mining

Despite rapid acceleration in energy-related capital expenditure, output (-1.4% per annum) and employment (-0.6% per annum) in mining declined relative to other industries. Energy conservation sharply curtailed oil and gas production, while most metal and industrial minerals (except iron ore and uranium) experienced much slower output growth (Figure 3.6).

Manufacturing

The sharp downturn in domestic and export demand in 1975 affected major sub-sectors such as forestry-based products, primary metals, and transportation equipment. International competitiveness improved in 1978 and 1979, and growth recovered strongly in investment-oriented industries such as machinery, electrical products and metal fabricating, and in non-durables such as printing and publishing. Nonetheless, overall employment and capital investment expansion was modest. The sector grew at a 2.5% annual rate during the 1974 to 1979 period (Figure 3.7).

Construction

Between 1974 and 1976, expansion was led by engineering and non-residential construction (large energy projects and the Olympics in Montreal). In the late 1970s, housing starts fell sharply and the inventory of unsold houses rose with rising mortgage rates in 1979. The overall growth rate during this period was 2.0% annually.

c. Regional Developments

Two developments helped to maintain the traditional shares of national employment and output in the Atlantic Provinces - the introduction of the 200-mile coastal limit which increased quotas for Canadian fishermen, and the coming on-stream of the large Churchill Falls electricity project.

The economy in Central Canada suffered due to higher oil prices which pushed up manufacturing costs and reduced disposable income, leaving less to be spent on goods and services.

The westward migration of economic activity spurred expansion in the Western Provinces. In particular, output growth was strong in oil and gas and mining in Alberta, potash and uranium mining in Saskatchewan, and agriculture and metals mining in Manitoba. Alberta's fortunes were further enhanced with the accompanying strong expansion in the service sector as population growth, mainly from net inward migration, doubled housing starts between 1974 and 1981. British Columbia's rate of growth was second only to Alberta's due to its strong growth in base metals and energy products. With the exception of the 1975 downturn, the forestry sector in British Columbia also performed robustly.

3.1.2 Overall Economic Performance (1980 to 1984)

The Recession Period of 1981-1982

Since Canadian economic policy did not deal head-on with the first round of oil price increases in 1974 (by holding domestic prices below world prices during this period), Canada faced a more significant restructuring of its economy when oil prices increased again in 1979. Monetary policy attempted to stem the inflationary consequences of this round, but the resulting higher interest rates were not enough to slow personal and corporate credit demand. Despite high real interest rates (i.e. interest rates adjusted for inflation), businesses and individuals borrowed heavily to purchase real assets as a hedge against inflation, and output rose between mid-1980 to early 1981.

Consumer confidence waned quickly in the first half of 1981 under the joint impact of high interest rates and over-extended personal credit. Export sales and corporate profits fell sharply, reflecting lower consumer and international demand and the cost squeeze from earlier large wage settlements. By late 1981, businesses began to reduce output and employment, which, in turn, led to an unprecedented drop in consumer spending, corporate revenue, and employment. The severity of the 1981-1982 recession was exacerbated by a rise in personal savings and considerable pressure on the corporate sector as the pre-recession investment boom was mainly financed through variable-rate interest debt. For the first time since 1953, both output and employment declined simultaneously during a recession.

The Recovery of 1983-1984

Despite the severity of the recession, inflation persisted above 10% through early 1982 and the federal government issued voluntary wage guidelines of 6% and 5% for 1982 to 1983. Declining inflation and interest rates during the second half of 1982 formed the basis for revival. The most significant development was the surge in export demand, particularly to the United States, as the Canadian dollar continued to depreciate against the U.S. dollar.

Consumer confidence was gradually restored with the savings rate falling from 15% in 1982 to 13% in 1984. Nonetheless, total investment demand remained weak as a result of continuing excess capacity, the weak financial position of Canadian corporations, and the fall-off in energy and mining sector investment due to the weakening in commodity prices internationally.

Although, from late 1982 to 1984, the national numbers for Canada show a robust recovery, it has been Central Canada that has enjoyed the growth while Eastern and Western Canada have continued to suffer from weak international resource markets.

a. The Leading Industries

Service industries such as telecommunications carriers and services to business management were not as adversely affected during the 1979 to 1984 period as were the other sectors of the economy. These two sectors recorded output growth of 3.6% and 4.6% annually against the 1.4% annual rate of the Canadian economy. Although these industries all recorded losses in output during the 1981-1982 recession in relative terms, their losses were the smallest and led to an overall growth rate which was higher than most other industry sectors.

In general, rising interest rates shifted demand away from the capital-intensive, goods-producing sector and into the service industries. The utilities also responded to increases in industrial activity and export demand. Overall, growth rates in the service sector and, in particular, services to business management, remained strong. The exception was accommodation and food services which fell by -0.5% annually.

b. The Lagging Industries

The lagging industries, concentrated in the goods-producing sectors, performed at levels lower than the already modest 1.4% average annual rate of growth in Canadian GDP during the 1979 to 1984 period. They were particularly sensitive to adverse economic conditions such as high real interest rates and decreasing export demand.

Construction

The residential construction sector was particularly hard hit by high interest rates during this period, while non-residential construction was adversely affected by sharp declines in corporate profits, low rates of capacity utilization and, hence, a collapse in business capital investment. Overall output for this sector declined at a 2.7% annual rate from 1979 to 1984.

Manufacturing

Despite a strong recovery in the auto sector in 1984, which reflected a strong increase in exports to the United States market, housing-related industries posted significant declines and non-durables recorded a negative growth rate of 0.1% annually. This combination resulted in static growth for manufacturing in this five-year period as the recovery failed to regain pre-recession peaks.

Mining

The mining sector is highly dependent on export demand which declined sharply as industrial production worldwide fell during the recession. GDP of the mining sector grew at only a 0.7% annual rate from 1979 to 1984. Idle capacity was not reopened as the recovery began to take hold because of excess supply capacity internationally.

c. Regional Developments

Despite a recovery in primary sector output in agriculture, fisheries and forestry in 1983 and 1984, the rate of overall economic growth in the Atlantic region remained below the national level. The absence of a well-developed industrial structure continued to plague the region with its dependence on cyclical resource industries facing increased world competition.

The dominance of manufacturing activity in Central Canada resulted in a severe recession in 1981 and 1982. However, in 1983 and 1984, Ontario, Quebec, and Manitoba started to enter a recovery phase. The pick-up in Quebec was strong due to increased demand for automobiles, durable goods, retail trade and housing construction. Ontario enjoyed above-average growth rates as the value of manufacturing rebounded from recessionary lows, led principally by the transportation equipment industry as North American auto demand surged in response to deferred demand following the recession.

In the Western Provinces, the recovery in Saskatchewan fell below the national average due mainly to the stagnant or declining grain prices in the dominant agricultural sector which offset the slight gains in housing starts and the service industries. Manitoba recovered smartly largely as a result of a relatively more diversified economy which is less dependent on energy prices. Alberta was affected by high interest rates and declining world oil prices, which significantly narrowed the gap between rising regulated prices domestically and international prices in 1982, resulting in the deferral of a number of megaprojects. In the meantime, the federal Petroleum Incentive Program grants stimulated exploration activities away from Western Canada into the frontier lands. Thus, Alberta's overall rate of economic growth, investment and employment all declined. The growth in British Columbia was restrained due to declines in the prices for its chief resources such as lumber, pulp and paper, copper and coal products, which recovered only moderately.

In the recovery period following the global business recession of 1981-1982, growth rates of the regions in Canada differed widely as the general recovery took hold, as shown in the preliminary statistics on Gross Provincial Product in Table 3.2.

TABLE 3.2

Regional Gross Provincial Product, 1981-1984
Annual Percent Change

	Current Dollars				Implicit Price Index (Canada)	Constant Dollars*			
	Atlantic Canada	Quebec	Ontario	Western Canada		Atlantic Canada	Quebec	Ontario	Western Canada
1981-1982	11.3	5.4	4.0	4.5	8.7	2.4	-1.9	-4.3	-3.9
1982-1983	12.7	6.5	10.5	4.9	5.0	7.4	0.3	5.3	0.0
1983-1984	10.9	9.8	12.7	6.5	3.4	7.2	6.2	9.0	2.9

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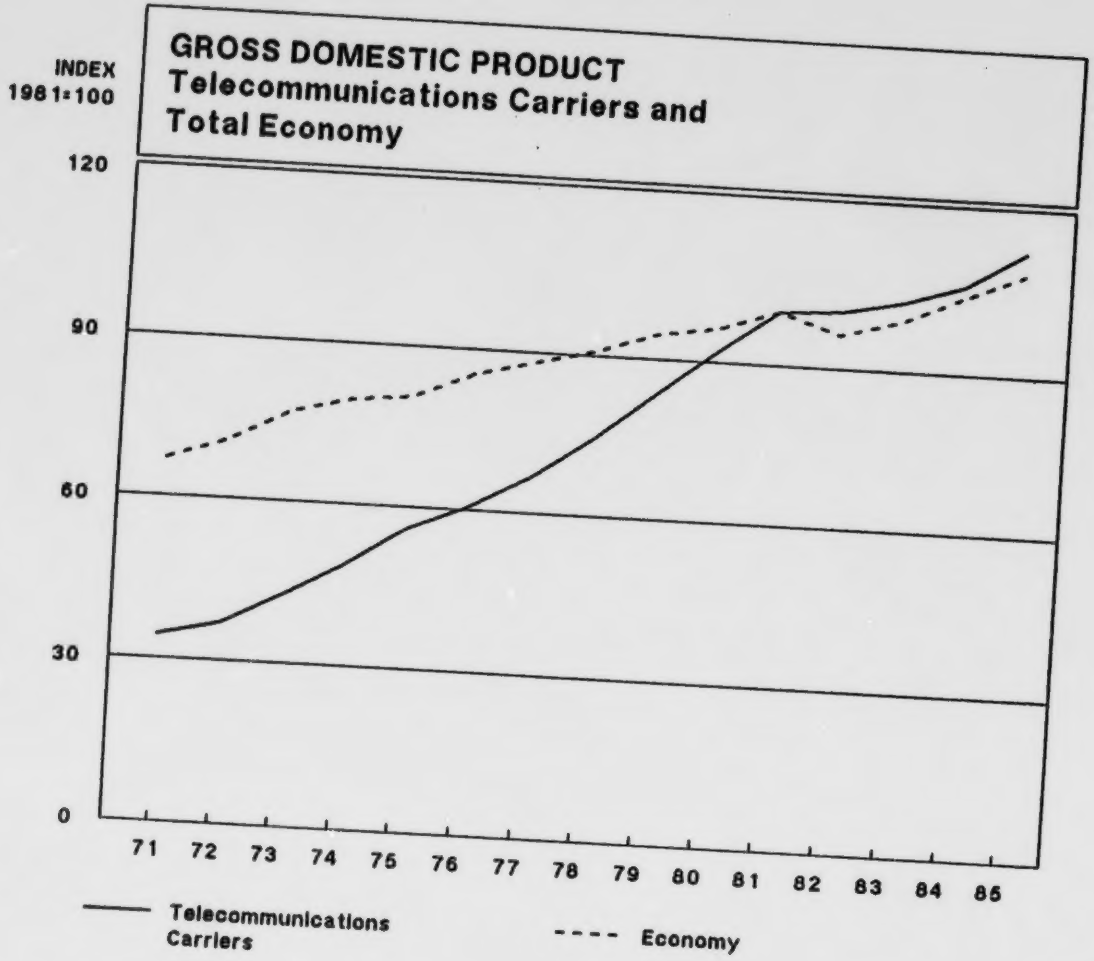
* Current dollars adjusted for inflation using the Implicit Price Index, 1981=100, for Gross Domestic Product Canada.

Source: Statistics Canada, Provincial Economic Accounts, Cat. No. 13-213, and National Income and Expenditure Accounts, Cat. No. 13-201.

FIGURE 3.8



Source: Statistics Canada, Gross Domestic Product by Industry (1961-1980), Cat. No. 15-512 Occasional; and Gross Domestic Product by Industry, Cat. No. 15-001 Monthly.

The locomotive of growth was the United States' economy, and Central Canada (Ontario, in particular) followed into the recovery phase as auto exports to the United States expanded quickly. The oil-based economies of the West fell during the downturn in 1982 and remained relatively constrained in light of weak oil, metals, resource and agricultural prices through 1983 and 1984. The Atlantic region grew out of the recession with higher fish exports and lumber production (supporting the quick rebound in housing construction in Ontario and the United States). Nonetheless, weak resource prices such as mineral commodities and pulp and paper caused the region's growth to be slower than that of Ontario. This has resulted in desynchronized levels of economic activity across Canada.

3.1.3 Comparative Analysis: Telecommunications and the National Economy

This section of the report presents a comparative analysis of the telecommunications industry to the national economy and selected national industries. The economic indicators include constant dollar Gross Domestic Product, number of employees, capital investment, profitability, and revenues per employee. The comparative average annual growth rates in each of the indicators are calculated by industry across three time periods - 1974 to 1979, 1979 to 1984, and 1974 to 1984. Sectors are categorized by their relative economic performance into three groups: i) those industries that have achieved above average growth rates; ii) average growth; or iii) below average growth. The analysis focuses on the factors stimulating the observed level of performance and how these other sectors compare with the telecommunications industry in this regard.

Table 3.1 shows that the growth in economic output by telecommunications carriers, as measured by constant dollar Gross Domestic Product, exceeded that of the national average in each of the three time periods studied, i.e., 1974 to 1979, 1979 to 1984 and 1974 to 1984. (This is shown graphically by the steeper slope of the telecommunications carriers GDP growth in Figure 3.8.) The average annual growth rate from 1974 to 1984 of 5.5% was, in fact, second only to the 6.3% average annual rate recorded by the Services to Business Management industry and exceeded the national economy's 2.3% rate by a wide margin. The GDP growth rate for the telecommunications carriers was more than double that of the national average in the two five-year periods studied, 7.4% vs. 3.2% between 1974 and 1979, and 3.6% vs. 1.4% between 1979 and 1984. The share of Canadian GDP accounted for by the telecommunications carriers grew steadily from 2.4% in 1974 to 3.3% in 1984.

The primary reason for this relatively high growth of output in the telecommunications carriers industry lies in the nearly 10% average annual rate of increase in long distance calls during the 1974 to 1979 period, which was more than twice the rate of increase in local calls. In the late 1970's, several carriers initiated major programs designed to upgrade the quality of service available to subscribers in remote and rural areas, notably in Ontario, Quebec, Alberta and the North. One of the major achievements

TABLE 3.3

Employment by Industry
Selected Years 1974, 1979, 1984
Thousands

Industries	1974	% of Total	1979	% of Total	1984	% of Total	Compound Annual Rate Of Change (%) 1974-1979	1979-1984	1974-1984
Canada Total	9,125.0	100.0	10,395.0	100.0	11,000.0	100.0	2.6	1.1	1.9
Telecommunications Carriers[1]	95.8	1.0	111.3	1.1	104.3	0.9	3.0	-1.3	0.9
Telecommunications Equipment Manufacturers	44.3	0.5	39.3	0.4	51.7	0.5	-2.4	5.6	1.6
Finance, Insurance and Real Estate	460.0	5.0	554.0	5.3	631.0	5.7	3.8	2.6	3.2
Wholesale Trade	255.4	2.8	278.8	2.7	472.5	4.3	1.8	11.1	6.3
Services to Business Management	113.3	1.2	142.3	1.4	427.0	3.9	4.7	24.6	14.2
Education and Health Services	N/A	-	N/A	-	1,582.5	14.4	-	-	-
Broadcasting	22.8	0.2	30.6	0.3	29.7	0.3	6.1	-0.6	2.7
Accommodation and Food Services	181.2	2.0	250.4	2.4	491.4	4.5	6.7	14.4	10.5
Construction	586.0	6.4	644.0	6.2	572.0	5.2	1.9	-2.3	-0.2
Wood, Paper and Forestry	288.5	3.2	305.0	2.9	275.6	2.5	1.1	-2.0	-0.5
Electric Power, Gas and Utilities	88.3	1.0	108.0	1.0	115.7	1.1	4.1	1.4	2.8
Transportation	383.8	4.2	388.8	3.7	447.2	4.1	-0.3	2.8	1.5
Mining and Petroleum	118.7	1.3	115.2	1.1	118.4	1.1	0.6	0.5	-0.03
Manufacturing	1,978.0	21.7	2,071.0	19.9	1,968.0	17.9	0.9	-1.0	-0.05
Data Processing[2]	N/A	-	N/A	-	N/A	-	-	-	-
Printing and Publishing	73.1	0.8	78.7	0.8	112.1	1.1	1.5	7.3	4.4
Food and Beverages	204.5	2.2	213.5	2.1	220.8	2.0	0.9	0.7	0.8
Government	640.0	7.0	701.0	6.7	791.0	7.2	1.8	2.4	2.1
Agriculture	474.0	5.2	484.0	4.7	476.0	4.3	0.4	-0.3	0.04
All Other*	3,117.3	34.2	3,879.1	37.3	2,113.1	19.2			

Note: 1 Telcos, telegraph and satellite communications included.
2 Not available.

Source: Statistics Canada, Historical Labour Force Statistics, Cat. No. 71-20 1986; Employment, Earnings and Hours, Cat. No. 72-002; Energy, Mines & Resouces Canada, Annual Census of Mines Quarries and Oil Wells, Radio & Television Broadcasting, Cat. No. 56-204; Cat. No. 26-201; and Communications, Service Bulletin, Cat. No. 56-001, Vol. 15, #4.

involved the conversion of a substantial number of party lines to private line services. At the same time, the Ontario Government and Bell Canada also participated in the North of 50° program which was designed to introduce basic telephone service into the remote northern communities. Many provincially regulated telcos also participated in a general effort to improve rural services which expanded the customer base for telecommunications services across Canada.

Telecommunications equipment manufacturers, by comparison, recorded relatively sluggish growth of only 0.6% annually in the 1974 to 1979 period compared to the 3.2% annual growth rate in the national economy. Significant revenue growth in manufacturing did not occur until the 1979 to 1984 period, when equipment demand rose as a result of technological change. The real output of Canadian telecommunications manufacturers generally fluctuated according to telcos' performance rather than because of economic cycles as a result of the high degree of vertical integration in the Canadian industry.

The discussions with telecommunications carriers indicated that Canadian telcos generally prefer to purchase Canadian equipment, with over 90% of equipment purchases being domestically sourced. Thus, the telecommunications manufacturing industry benefited from this purchase preference as demand for technologically advanced equipment by Canadian carriers rose with the change from analog to digital equipment in the late 1970's. Once the digital standard of equipment was established, carriers preferred to maintain the same standards for planning purposes. This practice has reinforced the sourcing of Canadian technology with compatible standards over the short term.

More recently, the manufacturers' output has been influenced by changing trade conditions. In 1983-1984, the break-up of A.T.&T. in the United States expanded export opportunities in the United States. The strong growth during 1979 to 1984 resulted in an overall GDP growth rate of 2.2% annually over the period 1974 to 1984. This almost equalled the 2.3% rate for the national economy, and maintained the sector's share of Canadian GDP at the 0.5% level.

Table 3.3 shows that employment in the telecommunications carriers industry grew at a rate of about half the national average between 1974 and 1984. The stronger growth of 3.0% per annum in the 1974 to 1979 period was mainly attributable to increasing demand for services and expanding services into rural areas, while declining growth in recent years was largely due to increased efficiency through automation and competition. As telcos and satellite and telegraph service companies prepared for competition, labour saving technology was widely accepted as a cost efficiency measure. This contributed to a 18.2% drop in the relative share of carrier employment (from 1.1% to 0.9%) or 7,000 employees in absolute terms from 1979 to 1984.

The equipment manufacturers recorded substantial employment growth as a result of the changing technology and, more importantly, because of positive revenue growth in some product lines such as large switches, where Canadian technology is considered to be leading-edge in both domestic and global markets. The equipment manufacturing sector employment suffered a 2.4% average annual rate of decline in the 1974 to 1979 period as revenue growth was slower than the later five-year period. Although employment growth accelerated to an annual average 5.6% rate from 1979 to 1984, the earlier declines led to only a 1.6% annual rate of increase over the long term, slightly below the national average growth rate of 1.9% per annum. The sector maintained about a 0.5% share of Canadian employment from 1974 to 1984.

Telecommunications carriers also increased capital investment at a rather consistent 2.3% average annual rate from 1974 to 1984 which was below the national average growth rate of 3.1%. This relatively slow rate of growth resulted in the carriers lagging behind all other industries' capital investment growth, with the exception of education and health services, wood, paper and forestry, government, and accommodation and food services. This steady pattern of increases in capital spending reflects the long-term planning horizon of telco investments which tend to be distributed over a number of years.

By contrast, capital investment growth in the equipment manufacturing sector reversed a 0.8% annual rate of decline in the 1974 to 1979 period to an extraordinarily rapid 30% annual rate of increase during the 1979 to 1984 period. Most of this investment growth was the direct result of advances in digital technologies and sustained investment by major firms such as Nortel, Spar, Gandalf and, until 1985, Mitel, to retain the Canadian presence worldwide. Mitel's eroding market share about 1985 stemmed from delays in introducing new technology, over-ambitious production of previous years and internal cost over-runs which ended the rapid corporate growth experienced since its inception in 1973.

Profits in the telecommunications carriers industry, in current dollar terms, grew at a solid 12.6% annual rate over the ten-year period. This rate of growth in telecommunications carriers industry profits, however, lagged behind those in the electric power, gas and utilities, and privately-owned broadcasting industries. In absolute terms, however, the telecommunications industry's profits far exceeded that of the broadcasting industry. They were higher than those of the utilities in 1974 and 1979, but fell behind in 1984.

There are no officially published statistics on industry profits available for comparative purposes on the telecommunications equipment manufacturing industry.

TABLE 3.4

Operating Income Per Employee
Selected Years 1974, 1979, 1984
Constant $ 1981

Industries	1974	1979	1984	Compound Annual Rate Of Change (%) 1974-1979	1979-1984	1974-1984
Telecommunications Carriers	52,584.3	61,914.5	77,281.3	3.3	4.5	3.9
Telecommunications Equipment Manufacturers[1]	50,233.7	56,522.3	62,333.0	2.4	2.0	2.2
Finance, Insurance & Real Estate	N/A	N/A	N/A	-	-	
Wholesale Trade	9,195.4	10,098.3	2,964.4	1.9	-21.7	-10.7
Services to Business Management	N/A	7,454.0	2,223.2	-	-21.5	-
Broadcasting	35,438.6	37,196.1	44,582.5	1.0	3.7	2.3
Accommodation & Food Services	N/A	1,351.0	236.3	-	-29.4	-
Construction	N/A	1,635.6	460.3	-	-22.4	-
Wood, Paper & Forestry	8,613.0	10,551.1	2,023.2	4.1	-28.1	-13.5
Electric Power, Gas & Utilities	2,831.3	4,463.0	6,593.8	9.5	8.1	8.8
Transportation	2,072.7	1,686.0	1,111.6	-4.0	-8.0	-6.0
Mining & Petroleum	45,250.2	59,505.2	32,181.6	5.6	-11.6	-3.4
Manufacturing	6,935.2	7,783.8	5,668.4	2.3	-6.1	-2.0
Printing & Publishing	5,492.5	5,259.2	4,507.6	-0.9	-3.0	-2.0
Food & Beverages	5,325.2	5,984.1	4,440.2	2.4	-5.8	-1.8

Note: Current dollar data deflated by the Canadian Consumer Price Index (all items).

[1] Value of shipments per employee; current dollars deflated by GDP Implicit Price Index.

N/A - Not available.

SOURCE: Statistics Canada, Industrial Corporations Financial Statistics, Quarterly Cat. No. 61-003; Employment Earnings and Hours, Cat. No. 72-002; Radio and Television Broadcasting, Cat. No. 56-204, and Energy Mines & Resources Canada, Annual Census of Mines Quarries & Oil Wells, Cat. No. 26-201.

Table 3.4 provides an analysis of productivity as measured by constant dollar operating income per employee, and shows that the telecommunications carriers industry achieved a 3.9% average annual rate of increase from 1974 to 1984.[1] Only the electric power, gas and utilities sector exceeded the rate of increase in revenue per employee by the telecommunications carriers industry.

Revenue per employee for the telecommunications carriers accelerated from a 3.3% annual growth rate from 1974 to 1979 to a 4.5% annual growth rate from 1979 to 1984. This indicates that reduced labour through technology was a successful method to maintain productivity. Although the relative growth rate was slower for the carriers compared to broadcasting and the utilities, the much larger absolute size of the carriers' revenue per employee measure cannot be ignored.

Telecommunications equipment manufacturers exhibited a healthy productivity performance over the period 1974 to 1984 with a 2.2% average annual rate of increase. This was similar to the 2.3% rate achieved by broadcasting, but lagged behind both the telecommunications carriers and utilities sectors. Despite a slowdown from 2.4% to 2.0% annually in the 1979 to 1984 period, higher real output boosted overall productivity. Once again, in absolute terms, the telecom manufacturing revenue per employee is consistently above that of the other selected industries, except for telecommunications carriers.

a. Sectors With Above Average Growth Rates

The analysis on the relative growth performance of the selected major national industries and telecommunications is best viewed in the context of the structural shifts within the national economy with the growth of service industries in the economy and the declining relative share of goods-producing industries. This provides the basis for understanding of how various sub-sectors within these two major industrial groups have performed.

The sectors selected by the federal/provincial steering committee for comparative analysis in this study, can be grouped into the goods-producing and service-producing categories.

- Goods-producing sectors:
    - Manufacturing (including telecommunications equipment, printing and publishing, and food and beverages);
    - Agriculture;
    - Mining and Petroleum;
    - Wood, Paper and Forestry;
    - Construction; and
    - Electric, Power, Gas and Utilities.

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[1] This is not a theoretically sufficient measurement of productivity of a regulated industry, but is adopted here due to the lack of Total Factor Productivity measures for all selected industries.

TABLE 3.5

Summary of Sectors with Above Average Growth Rate by Indicators
1974 to 1984

Gross Domestic Product	Employment	Capital Investment	Profitability	Productivity
• Services to Business Management	• Services to Business Management	• Agriculture	• Telecommunications Carriers	• Telecommunications Equipment Manufacturers
• Telecommunications Carriers	• Finance, Insurance and Real Estate	• Mining and Petroleum	• Broadcasting	• Broadcasting
• Finance, Insurance and Real Estate	• Wholesale Trade	• Food and Beverages	• Electric Power, Gas and Utilities	• Electric Power, Gas and Utilities
• Wholesale Trade	• Broadcasting	• Telecommunications Equipment Manufacturing	• Printing and Publishing	
• Broadcasting	• Electric Power, Gas and Utilities	• Construction		
• Electric Power, Gas and Utilities	• Printing and Publishing	• Transportation		
• Printing and Publishing	• Accommodation and Food Services	• Broadcasting		
		• Wholesale Trade		
		• Finance, Insurance and Real Estate		
		• Printing and Publishing		

- Service-producing sectors:
  - Telecommunications Carriers;
  - Finance, Insurance and Real Estate;
  - Wholesale Trade;
  - Services to Business Management (including data processing);
  - Education and Health;
  - Broadcasting;
  - Accommodation and Food;
  - Transportation;
  - Government; and
  - Defense.

Again, by referring to the relative shares of constant dollar national GDP in the three selected years, the two main sectors account for the following:

- 1974: Goods-producing: 42.6%
  Services : 57.4%

- 1979: Goods-producing: 40.8%
  Services : 59.2%

- 1984: Goods-producing: 39.8%
  Services : 60.2%

Thus, the sector analysis confirms our macroeconomic findings that the service sectors increased their relative importance in the national economy from 57.4% in 1974 to 60.2% in 1984. At the same time, the relative share accounted for by the goods-producing sector fell from 42.6% in 1974 to 39.8% in 1984.

Of greater interest is the performance of the two telecommunications sub-sectors, the carriers and the equipment manufacturers, within their respective industrial groupings. On the basis of the selected industries shown in Table 3.1, within the service-producing sector the telecommunications carriers industry's share of GDP rose consistently between 1974 and 1984 from 4.9% (1974) to 5.9% (1979), and 6.2% (1984). Within the goods-producing sector, telecommunications equipment manufacturing recorded a decline in its relative share from 1.4% (1974) to 1.2% (1979), but subsequently rebounded to 1.3% (1984).

Table 3.5 presents a summary of the sectors which have recorded above average growth rates by the selected economic indicators during the period 1974 to 1984.

The highest average annual rate of output growth as measured by GDP was achieved by the services to business management sector across all the time periods studied - 8% (1974 to 1979), 4.6% (1979 to 1984) and 6.3% (1974 to 1984). The overall economy recorded growth rates of only 3.2% (1974 to 1979), 1.4% (1979 to 1984) and 2.3% (1979 to 1984). Sub-sectors such as computer services, accounting, legal services, management consulting, etc.

recorded strong growth in the last decade as the Canadian economy shifted from the traditional reliance on primary resource and goods-producing industries towards the service sector for growth. The share of GDP accounted for by services to business management also rose from 2.8% in 1974 to 4.2% in 1984.

The other sectors which recorded above average output growth throughout the decade include:

- Telecommunications Carriers (5.5% per annum)
- Electric Power, Gas and Utilities (4.4%)
- Printing and Publishing (4.0%)
- Finance, Insurance and Real Estate (3.8% per annum)

The shares of GDP of these four sectors also rose from 2.4% to 3.3%, 2.9% to 3.5%, 1.2% to 1.4%, and 11.7% to 13.5%, respectively, between 1974 and 1984.

In addition, the service industry boom contributed to strong employment gains in the services to business management, accommodation and food services, and wholesale trade industries within the 1974 to 1984 period by recording average annual growth rates of 14.2%, 10.5% and 6.3%, respectively. By comparison, the overall economy recorded only a 1.9% annual rate of growth in employment within the same period.

Other sectors with above average employment growth between 1974 and 1984 included:

- Printing and Publishing (4.4% per annum)
- Finance, Insurance and Real Estate (3.2%)
- Broadcasting (2.7%)
- Electric Power, Gas and Utilities (2.8%)

The ten-year trend in employment increases, however, masked the slowdown in the broadcasting and utilities industries in the second five-year period. The Canadian broadcasting industry suffered from sluggish growth in national advertising revenue, while the reduced growth in electricity consumption slowed employment growth in the utilities sector.

Capital investment growth between 1974 and 1984 in the following industries significantly surpassed the national annual average rate of 3.1%:

- Telecommunications Manufacturing (13.5% per annum)
- Mining, Oil and Gas (9.0%)
- Wholesale Trade (8.8%)
- Printing and Publishing (6.8%)
- Transportation (5.6%)
- Construction (5.5%)

TABLE 3.6

Summary of Sectors with Average Growth Rate by Indicators
1974 to 1984

Gross Domestic Product	Employment	Capital Investment	Profitability	Productivity
• Agriculture	• Government	• Manufacturing	• Mining and Petroleum	• Manufacturing
• Telecommunications Equipment Manufacturing		• Electric Power, Gas and Utilities	• Manufacturing	• Printing and Publishing
• Transportation Services			• Food and Beverages	• Food and Beverages
• Education and Health Services				
• Government				

The rapid (30% per annum) increase in telecommunications manufacturing investment during the 1979 to 1984 period boosted overall investment in telecommunications manufacturing during the entire 1974 to 1984 period. Major investment by large companies such as Nortel, Spar and new companies such as NovAtel lifted investment spending.

There is no "national average" profitability measure available for comparative purposes because many of the key industries selected are non-profit, e.g., government, defense, and education and health services. Data are also not available for data processing and agriculture. Using the 12.6% per annum long-term growth rate in telecommunications carriers industry profits as a benchmark, three industries - two of them regulated - achieved higher or comparable growth rates. These included:

- Electric Power, Gas and Utilities (18.5% per annum)
- Broadcasting (16.9%)
- Printing and Publishing (11.6%)

The annual rate of increase in profits for broadcasting slowed dramatically in the 1979 to 1984 year period, while the utilities and printing and publishing industries continued their strong growth.

Productivity gains in the broadcasting and utilities industries were also higher than in the telecommunications carriers and equipment manufacturing industry, with 8.8% and 2.3% annual rates of increases, respectively, compared to a 2.2% rate in the telecommunications equipment manufacturing industry.

b. Sectors with Average Growth Rates

Table 3.6 presents a summary of the sectors which recorded average growth rates in selected economic performance indicators between 1974 and 1984.

The long-term output growth in the following industries roughly equalled the national average of 2.3% per annum since 1974:

- Agriculture (2.5% per annum)
- Transportation Services (2.5%)
- Government, (less Defense) (2.4%)
- Education and Health Services (2.05)

The share of Canadian GDP accounted for by these four industries remained relatively stable. In 1984, and ranked in order of importance, these were:

- Education and Health Services (10.3% of GDP)
- Transportation Services (6.5%)
- Government, (less Defense) (6.0%)
- Agriculture (2.5%)

TABLE 3.7

Summary of Sectors with Below Average Growth Rate by Indicators
1974 to 1984

Gross Domestic Product	Employment	Capital Investment	Profitability	Productivity
• Mining and Petroleum	• Telecommunications Carriers	• Telecommunications Carriers	• Wholesale Trade	• Wood, Paper and Forestry
• Manufacturing	• Telecommunications Equipment Manufacturers	• Wood, Paper and Forestry	• Transportation Services	• Mining and Petroleum
• Food and Beverages	• Agriculture	• Education and Health Services	• Wood, Paper and Forestry	• Wholesale Trade
• Wood, Paper and Forestry	• Mining and Petroleum	• Accommodation and Food Services		• Transportation Services
• Construction	• Manufacturing	• Government		
• Accommodation and Food Services	• Food and Beverages			
• Defense	• Wood, Paper and Forestry			
	• Construction			
	• Transportation Services			

In terms of employment growth, only the government sector recorded an "average" rate of growth of 2.1% per annum between 1974 and 1984, which is still higher than the 1.9% rate of increase recorded by the overall economy.

The long-term growth in capital investment expenditures in electric power, gas and utilities, and in the manufacturing sector were considered average. In the utilities industry, a rapid 9.3% annual average rate of increase from 1974 to 1979 turned into a 2.3% annual rate of decline in total capital investment from 1979 to 1984 as a marked slowdown in the rate of growth in electricity consumption and historically high real interest rates stalled the growth in utility sector investment.

c. Sectors with Below Average Growth Rates

Table 3.7 shows a summary of the sectors with below average growth rates in selected economic performance indicators between 1974 and 1984. Most of the industries recording below average growth rates in GDP were cyclical industries:

- Wood, Paper and Forestry (1.2% per annum)
- Manufacturing (1.2%)
- Mining and Oil and Gas (-0.3%)
- Construction (-0.4%)

Shifting international competitiveness, excess supply capacity for most metals and minerals, and fluctuations in world oil prices combined to cause the relatively slow output growth of only 1.2% and -0.3% per annum, respectively, for the wood, paper and forestry, and the mining, oil and gas industries. The shares of Canadian output accounted for by these two industries lost ground due to their relatively slower growth. Despite a basically flat output performance for manufacturing activities from 1979 to 1984, the manufacturing sector remains as Canada's most important industry sector, accounting for just over 21.0% of GDP in 1984. The defense industry showed modest output growth of only 0.5% per annum over the ten years which is largely the result of the federal government's spending priorities and overall fiscal restraint during the period.

Six industries consistently showed below average rates of growth in employment over the 1974 to 1984 period:

- Food and Beverages (0.8% per annum)
- Agriculture (0.04%)
- Mining, Oil and Gas (-0.03%)
- Manufacturing (-0.05%)
- Construction (-0.2%)
- Wood, Paper and Forestry (-0.5%)

Since many of these industries had below average growth in output, employment growth also suffered.

The five industries with below average growth rates in capital investment over the 1974 to 1984 period were:

- Telecommunications Carriers (2.3% per annum)
- Wood, Paper and Forestry (2% per annum)
- Education and Health Services (1.7%)
- Government (0.8%)
- Accommodation and Food Services (-1.4%)

The budgetary constraints in the government sector, as well as education and health services, had a negative impact on the rate of expansion in capital investment in these sectors. Import competition and a sluggish construction industry contributed to the below average level of investment by the wood, paper and forestry industry.

The general weakness and cyclical fluctuations in the wood, paper and forestry industries affected profitability, resulting in the lowest annual rate of increase of only 2.1% between 1974 and 1984. Strong cyclical fluctuations and increasing competition from Scandinavian countries caused a sharp downturn in forestry sector profits from 1979 to 1984, with an average 9.5% annual decline in current dollar profits.

Not surprisingly, the forestry industry also performed poorly in terms of productivity improvements, with a 13.5% annual decline from 1974 to 1984. Although many of the selected industries lost grounds in terms of productivity from 1974 to 1984, sectors with major productivity decreases were:

- Mining, Oil and Gas (-3.4% per annum)
- Transportation Services (-6.0%)
- Wholesale Trade (-10.7%)

3.1.4 The Growing Economic Significance of the Telecommunications Industry

This analysis confirms that Canada has been undergoing a fundamental transition, from an industrial-based to an information-based economy, similar to the trend elsewhere throughout the industrialized world. While the service sector has risen from 57% to 60% of GDP from 1974 to 1984, telecommunications carriers share of GDP rose by almost one-third, from 2.4% to 3.3%. With the exception of the electric power and utilities sector, four out of five of the sectors identified as achieving above average output growth are information-intensive businesses: services to business management; telecommunications carriers; finance, insurance and real estate; and printing and publishing. Therefore, within the last decade, information has become a key resource while the traditional natural resources of mining, forestry and agriculture have lagged in growth.

Because of the unique geography of Canada, with population dispersed across a wide land mass, telecommunications services serve the role of an information highway. As transportation routes were essential for goods movement during the industrial stage of Canada's development, access to telecommunications is crucial in mastering the information revolution. This was confirmed by business users.

Moreover, the telecommunications sector has risen in relative importance based on its share of the national GDP in spite of the many changes which have occurred in the operating environment, e.g., the introduction of competitive services (limited systems interconnect and terminal attachment), new entrants (enhanced service providers) and anti-inflation policies on regulated returns.

Telecommunications has emerged as a core sector within the economy where there are positive linkages in the development process - backward to the suppliers as shown by the accelerated growth in telecommunications manufacturing from 1979 to 1984, and forward to industries such as services to business management which can expand through the use of its input. The telecommunications industry thus promotes positive "externalities" in the sense that its development fosters advances in a broad range of activities. These beneficial "externalities" have positive effects on regional economies.

3.2 Telecommunications Sector Leads that of Goods-producing Sectors in All Provinces

This section of the report compares the economic performance of each province's telecommunications sector to the selected dominant economic sectors (e.g. transportation equipment manufacturing in Ontario, mining in Alberta, etc.). The key indicators selected for this comparison include constant dollar provincial domestic product and employment for each industry within the provinces over the period 1974 to 1984. The analysis focuses on the real annual growth rate of the indicators of each industry, the distribution of the various industries' real provincial product and employment, and the share of industrial output accounted for by the specific provincial industry in Canada.

3.2.1 Newfoundland

In 1983, the percentage distribution of Newfoundland's provincial GDP, by industry, was as follows:

Agriculture: 0.4%
Forestry: 0.7%
Fishing, Hunting and Trapping: 2.1%
Mining: 5.0%
Manufacturing: 7.9%
Construction: 6.9%
Electric Power, Gas Utilities: 4.4%
Total Goods-producing: 27.4%

TABLE 3.8

Newfoundland : Performance Indicators
Telecommunications vs. Selected Economic Sectors

GROSS DOMESTIC PRODUCT (Constant $ 1971 millions)	1974			1979			1983			AVERAGE ANNUAL RATE OF CHANGE (%)		
	VALUE	% OF PROVINCIAL GDP[3]	% OF INDUSTRY GDP[3]	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY GDP	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY	1974–1979	1979–1983	1974–1983
Telecommunications Carriers	103.4	6.0	4.7	199.6	8.4	6.3	214.6	8.4	5.8	14.1	1.8	8.5
Telecommunications Equipment Manufacturers	–	–	–	*	–	–	*	–	–	–	–	–
Mining[1]	151.0	7.9	2.2	498.5	13.2	3.6	272.2	5.0	1.3	27.0	-14.0	6.8
Fishing	17.5	1.5	14.7	37.4	2.9	17.9	33.0	2.1	19.0	16.4	-3.1	7.3

EMPLOYMENT	1974		1979		1984				
	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	1974–1979	1979–1984	1974–1983
Telecommunications Carriers	1,324	0.9	1,420	0.8	1,647	0.9	1.4	3.0	2.2
Telecommunications Equipment Manufacturers	–	–	*	–	*	–	–	–	–
Mining	6,675	4.5	5,914	3.5	2,918	1.7	-2.4	-13.2	-7.9
Fishing[2]	17,964	12.1	42,159	24.8	36,254	20.6	18.6	-3.0	7.3

[1] Current $ millions.
[2] Including fishing plant employees and fishermen.
[3] Provincial share of total industry GDP in Canada.
* Data withheld to meet secrecy requirements of the Statistics Act.

Source: Statistics Canada: Provincial Gross Domestic Product by Industry, Cat. No. 61-202; Employment, Earnings and Hours, Cat. No. 72-002; Energy, Mines & Resources, Annual Census of Mines Quarries & Oil Wells, Cat. No. 26-201; Department of Communications, Financial Statistics on Canadian Telecommunication Common Carriers; and Department of Fisheries, Annual Statistical Review.

Education and Related Services: 8.8%
Health and Welfare: 6.7%
Accommodation and Food Services: 2.1%
Provincial and Local Governments: 5.9%
All Other Services: 49.1%
Total Service-producing: 72.6%

The two industries selected for comparison were mining and fishing, which together accounted for 7.1% of the province's GDP in 1983. They also accounted for 22.3% of total provincial employment in 1984.

a. Mining Industry

Table 3.8 shows the relative performance between the telecommunications industry and the selected industry sectors in Newfoundland. Between 1974 and 1979, export-driven demand for Newfoundland's main mineral products, including iron ore, asbestos, lead and zinc, led to a 5.3 percentage points increase in the mining sector's share of provincial GDP, to 13.2%. Telecommunications carriers output, which rose at a 14.1% average annual rate during this period, was strongly influenced by Newfoundland Telephone's upgrading of services to Labrador after assuming responsibility for Labrador's telecommunications in 1974. Telecommunications' share of provincial GDP also rose by 2.4 percentage points between 1974 and 1979. During the 1979 to 1983 period, changes in steelmaking technology greatly reduced world demand for raw materials such as iron ore, while health concerns over asbestos use caused a sharp decline in Newfoundland's overall mining output. Moreover, mine closures, such as the Iron Ore Company of Canada with operations in Labrador for ores, and intermittent mining labour strikes, combined to lower the prominence of mining in the provincial economy. The provincial share of GDP for mining fell to 5.0% in 1983, but the sustained growth at a gradual pace (1.8%) in the telecommunications carriers industry enabled it to retain an 8.4% share of total provincial output.

Mining employment in Newfoundland was influenced by the sluggishness of the world mining commodities market and mine closures and lay-offs contributed to an average rate of decline of 7.9% per annum. A relatively more rapid (2.2% per annum) overall increase in telecommunications carriers employment was recorded, but the industry accounted for only about half of those employed in mining in 1984.

b. Fishing

The 16.4% average annual rate of increase in fishing sector GDP in the 1974 to 1979 period exceeded the 14.1% annual growth rate in the telecommunications carriers industry. The introduction of the 200-mile coastal fishing limit in 1977 and increased quotas were further aided by rising fish prices to produce the strong growth in fishing industry output. In the later four-year period, telecommunications output growth continued at

TABLE 3.9

Prince Edward Island: Performance Indicators
Telecommunications vs. Selected Economic Sectors

GROSS DOMESTIC PRODUCT (Constant $ 1971 millions)	1974			1979			1983			AVERAGE ANNUAL RATE OF CHANGE (%)		
	VALUE	% OF PROVINCIAL GDP[3]	% OF INDUSTRY GDP[3]	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY GDP	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY	1974-1979	1979-1983	1974-1983
Telecommunications Carriers	11.0	3.3	0.5	25.3	5.3	0.8	29.6	5.3	0.8	18.1	4.0	11.6
Telecommunications Equipment Manufacturers	-	-	-	*	-	-	*	-	-	-	-	-
Agriculture	23.2	9.8	0.6	32.6	8.9	0.8	33.1	8.5	1.1	7.0	0.4	4.0
Fishing	5.2	2.2	4.1	8.5	2.7	3.3	10.1	2.5	4.9	10.3	4.4	7.7

EMPLOYMENT	1974		1979		1984				
	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	1974-1979	1979-1984	1974-1984
Telecommunications Carriers	297	0.7	318	0.7	3.05	0.6	1.4	-0.8	0.3
Telecommunications Equipment Manufacturers	-	-	*	-	*	-	-	-	-
Agriculture	7,000	17.1	6,000	13.0	6,000	12.2	-3.0	0.0	-1.5
Fishing[1]	3,150	7.7	3,160	6.9	4,111	8.4	0.1	5.4	2.7

[1] Including fishing plant employees and fishermen.
* Data withheld to meet secrecy requirements of the Statistics Act.

Source: Statistics Canada: Provincial Gross Domestic Product by Industry, Cat. No. 61-202; Historical Labour Force Statistics, Cat. No. 71-001; Department of Communications, Financial Statistics on Canadian Telecommunication Common Carriers; and Department of Fisheries, Annual Statistical Review.

a slower rate of 1.8% annually, while fishing output declined at a 3.1% average annual rate. The problems that faced Newfoundland's fishing industry over this period included low fish stocks, shrinking export demand, high inventories, and structural disarray in the processing sector. A similar pattern of growth is found in fishing employment which grew at a rapid 18.6% annual rate initially and surpassed the rate of employment growth of 1.4% annually for telecommunications carriers by a significant degree from 1974 to 1979, but later recorded declines of 3.0% per annum in line with the market downturn. Nonetheless, the fishing industry remained Newfoundland's major employer with over 20% of the province's employment in 1984.

3.2.2 Prince Edward Island

In 1983, the percentage distribution of Prince Edward Island's provincial GDP, by industry, was as follows:

Agriculture: 8.5%
Forestry: less than 0.1%
Fishing, Hunting and Trapping: 2.5%
Mining: 0.0%
Manufacturing: 6.6%
Construction: 4.7%
Electric Power, Gas and Utilities: 1.7%
Total Goods-producing: 24.1%

Education and Related Services: 7.8%
Health and Welfare: 6.9%
Accommodation and Food Services: 2.9%
Provincial and Local Governments: 7.0%
All Other Services: 51.3%
Total Service-producing: 75.9%

The two industries selected for comparison were agriculture and fishing. The combined share of provincial GDP for these two industries was 11.0% in 1983 and accounted for 20.6% of total provincial employment.

a. Agriculture

Compared to the performance in the telecommunications carriers sector, the importance of the agricultural sector has decreased. The Island province's agricultural sector is heavily dependent on potato farming which accounts for nearly 40% of total provincial farm cash receipts. Lower prices for potatoes and dairy products and reduced demand for cash crops such as tobacco have contributed to a significantly lower rate of growth in the value of the agricultural sector output (Table 3.9). The rapid rise (18.1% per annum) in telecommunications carriers GDP is contrasted with a 7.0% annual rate of increase in agricultural GDP in the mid-to-late 1970's, followed by a 4.0% annual rate of increase in telecommunications carriers and a basically flat performance in the agricultural sector in the 1980s.

Overall agricultural employment growth in the last decade did not keep pace with that of the telecommunications industry, mainly due to a 3.0% annual rate of decline in the earlier five-year period. The agricultural sector still accounted for over 12% of total provincial employment, while the telecommunications carriers accounted for less than 1% of provincial employment.

b. Fishing

The performance in the fishing industry's output in Prince Edward Island followed the same pattern as in Newfoundland, as all the Atlantic provinces experienced policy-induced growth in fishing and higher prices during the 1970's, and subsequently slower growth as the markets turned down. Overall growth in fishing output, however, fell short of the expansion in the telecommunications carriers industry in Prince Edward Island over the period.

Although employment in the fishing industry showed no growth in the late 1970's, a much faster 5.4% annual rate of increase, beginning in 1979, allowed the overall employment in fishing to expand by 2.7% per annum and to exceed the telecommunications carriers employment growth (0.3% per annum) in the last decade. The fishing industry was an important employer in P.E.I. with an 8.4% share of provincial employment in 1984.

3.2.3 Nova Scotia

The percentage distribution of Nova Scotia's 1983 provincial GDP, by industry, was as follows:

Agriculture: 1.3%
Forestry: 0.3%
Fishing, Hunting and Trapping: 2.0%
Mining: 1.4%
Manufacturing: 11.7%
Construction: 5.5%
Electric Power, Gas and Utilities: 3.5%
Total Goods-producing: 25.7%

Education and Related Services: 8.1%
Health and Welfare: 6.8%
Accommodation and Food Services: 2.2%
Provincial and Local Governments: 4.8%
All Other Services: 52.4%
Total Service-producing: 74.3%

The two industries selected for comparison were food and beverages and transportation services. These two industries accounted for 6.9% of provincial GDP and 7.2% of total provincial employment in 1984.

TABLE 3.10

Nova Scotia: Performance Indicators
Telecommunications vs. Selected Economic Sectors

GROSS DOMESTIC PRODUCT (Current $ millions)	1974		1979		1983		AVERAGE ANNUAL RATE OF CHANGE (%)		
	VALUE	% OF PROVINCIAL GDP	VALUE	% OF PROVINCIAL GDP	VALUE	% OF PROVINCIAL GDP	1974-1979	1979-1983	1974-1984
Telecommunications Carriers	49.2	1.5	119.2	2.1	188.9	2.0	19.4	9.6	14.4
Telecommunications Equipment Manufacturers	9.5	0.3	14.9	0.3	17.3	0.2	9.4	3.0	6.2
Food and Beverages	86.0	2.6	198.4	3.4	260.0	2.8	18.2	5.6	11.7
Transportation Services	144.9	4.4	234.1	4.1	379.0	4.1	10.1	10.1	10.1

EMPLOYMENT	1974		1979		1984				
	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	1974-1979	1979-1984	1974-1984
Telecommunications Carriers	3,500	1.2	3,700	1.2	3,800	1.0	1.1	0.5	0.8
Telecommunications Equipment Manufacturers	900	0.3	700	0.2	600	0.2	-3.8	-3.0	-4.0
Food and Beverages	9,800	3.4	1,500	3.7	10,600	3.1	3.2	-1.6	0.8
Transportation Services	12,700	4.3	12,200	3.9	13,700	4.1	-0.8	2.3	0.8

Sources: Government of Nova Scotia, Department of Development.

a. Food and Beverages

Table 3.10 shows that Nova Scotia's food and beverages industry, in current dollar terms, grew by 18.2% annually between 1974 and 1979, which is less than the 19.4% annual rate of growth experienced by the telecommunications carriers output during the same period. This permitted the food and beverages industry to increase its provincial GDP share by 0.8 percentage points versus the telecommunications carriers 0.6 percentage point gain. The number of telephone calls in Nova Scotia was growing at 10% annually, which was the second highest rate of all the Atlantic provinces during this period. Growth in the food and beverages sector almost doubled the 9.4% annual rate of growth in the telecommunications equipment manufacturing sector. Although the growth momentum slowed for both the food and beverages and telecommunications carriers and equipment industries between 1979 and 1984, compared to the earlier five-year period, the loss in the share of provincial GDP was 0.6 percentage points (from 3.4% to 2.8%) for food and beverages, and only 0.2 percentage points (from 2.4% to 2.2%) for the combined telecommunications carriers and equipment sector.

The employment gain in the food and beverages sector in the late 1970s was three times as rapid as that of the provincial telecommunications carriers industry, reflecting the growing importance of fish products processing during the period. At the same time, declining output in telecommunications equipment manufacturing reduced the sector's labour force at an annual rate of decline of 3.8%. Growth in telecommunications carriers slowed in the 1979 to 1984 period, but food and beverages declined by 1.6% per annum. Nonetheless, food and beverages' share of provincial employment remained at about 3 times that of telecommunications carriers throughout the decade.

b. Transportation Services

The transportation services industry in Nova Scotia had consistent growth of 10.1% per annum in its current dollar GDP across the two five-year periods. Overall, this rate of growth for transportation services exceeded the relative growth rate in both telecommunications services and equipment manufacturing in all time periods, except against telecommunications carriers in the 1974 to 1979 period. The share of provincial GDP in the telecommunications industry rose from 1.8% to 2.4% in 1974 to 1979, but transportation services fell slightly from 4.4% to 4.1%, reflecting the relatively faster economic growth in the Western Provinces during this time. The consistent growth for transportation services between 1979 and 1984 helped the sector to maintain its 4.1% share of provincial GDP while the telecommunications industry declined slightly from 2.4% to 2.2%.

The transportation services sector is a leading employer in Nova Scotia. Following a small drop between 1974 and 1979, growth in transportation employment rebounded at a 2.3% annual rate, but productivity improvement and changing technology favouring more automation led to a 1.2% annual rate of decline in telecommunications equipment industry employment. The

TABLE 3.11

New Brunswick: Performance Indicators
Telecommunications vs. Selected Economic Sectors

GROSS DOMESTIC PRODUCT (Constant $ 1971 millions)	1974			1979			1983			AVERAGE ANNUAL RATE OF CHANGE (%)		
	VALUE	% OF PROVINCIAL GDP[3]	% OF INDUSTRY GDP[3]	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY GDP	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY	1974-1979	1979-1983	1974-1983
Telecommunications Carriers	41.8	1.6	1.9	76.0	2.2	2.4	96.2	2.8	2.6	12.7	6.1	9.7
Telecommunications Equipment Manufacturers	*	-	-	*	-	-	*	-	-	-	-	-
Food and Beverages	82.7	4.1	3.2	96.5	3.6	3.1	114.5	5.0	3.8	3.1	4.4	3.7
Forestry, Wood & Paper [1]	323.9	11.5	5.4	414.6	7.5	3.9	435.4	5.9	3.8	5.1	1.2	3.3

EMPLOYMENT	1974		1979		1984				
	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	1974-1979	1979-1984	1974-1984
Telecommunications Carriers	2,631	1.2	2,716	1.1	2,434	1.0	0.6	-2.2	-0.8
Telecommunications Equipment Manufacturers	*	-	*	-	*	-	-	-	-
Food and Beverage	8,830	4.0	10,072	4.1	10,169	4.1	2.7	0.2	1.4
Forestry, Wood & Paper	14,933	6.8	14,501	6.0	18,749	7.6	-0.6	5.3	2.3

[1] Current $ millions.
* Data withheld to meet secrecy requirements of the Statistics Act.

Source: Statistics Canada: Provincial Gross Domestic Product by Industry, Cat. No. 61-202; Employment Earnings and Hours, Cat. No. 72-002; and Department of Communications, Financial Statistics on Canadian Telecommunication Common Carriers.

transportation industry maintained its 4% share of provincial employment, while telecommunications carriers and equipment manufacturers together accounted for approximately 1.5% of total provincial employment.

3.2.4 New Brunswick

In 1983, the percentage distribution of New Brunswick's provincial GDP, by industry, was as follows:

Agriculture: 1.4%
Forestry: 1.9%
Fishing, Hunting and Trapping: 0.8%
Mining: 1.1%
Manufacturing: 13.0%
Construction: 4.6%
Electric Power, Gas and Utilities: 6.0%
Total Goods-producing: 28.8%

Education and Related Services: 6.9%
Health and Welfare: 6.5%
Accommodation and Food Services: 2.0%
Provincial and Local Governments: 5.5%
All Other Services: 50.3%
Total Service-producing: 71.2%

The two industries selected for comparison were food and beverages and the forestry, wood and paper industries. Combined, these sectors accounted for just under 11% of provincial GDP in 1983, and accounted for 11.7% of total provincial employment.

a. Food and Beverages

Table 3.11 shows that the rate of growth in New Brunswick's food and beverages industry during the late 1970's (3.1% per annum) was well below the growth experienced by the telecommunications carriers (12.7% per annum). Despite a drop of 0.5 percentage points in the share of provincial GDP for food and beverages from 1974 to 1979, it consistently exceeded the share of telecommunications carriers. By 1983, the food and beverages industry investment was accelerated by the opening of new plants by Humpty Dumpty, McCain's, Canada Packers and Dairytown Products, and expansions at Ocean Maid, Hub Meat Packers and L'Association Co-opérative des Pêcheurs. A higher rate of output growth (4.4% annually) was recorded by the food processing industry in the later period, and allowed the sector to enlarge its share of the provincial economy to 5.0% against the telecommunications carriers 2.8%.

The food and beverages industry also accounted for nearly four times more provincial employment than did employment by telecommunications carriers. The overall rate of growth in food processing employment, at 1.4% per annum, was significantly higher than the 0.8% average rate of decline in telecommunications carriers industry employment over the ten-year period.

Between 1979 and 1984, the telecommunications carriers industry reduced its total labour force at a 2.2% annual rate as the result of automation and productivity improvement measures.

b. Forestry, Wood, Paper and Allied Industries

The growth comparison between the forestry sector and the communications sector is best observed from the provincial distribution of GDP due to the different dollar basis for reporting industry GDP at the provincial level,

Although the rate of output growth in both the telecommunications carriers and forestry and wood manufacturing industries fell during the 1979 to 1983 period, the share of provincial GDP accounted for by the forestry sector declined by 1.6 percentage points, while telecommunications carriers share grew by 0.6 percentage points.

The deceleration in the forestry sector's performance was the result of a combination of cyclical fluctuations, shortage of timber supplies, spruce budworm infestations of softwoods, and decreasing competitiveness for pulp and paper in Europe following the depreciation of Scandinavian currencies.

Despite the slowdown in output growth, total employment in the forestry and wood manufacturing industries accelerated during the early 1980's at 5.3% per annum. This healthy employment growth to 1984 reflected the sharp increase in lumber demand in Canada and the United States due to rising activity in housing construction which followed the recession, and as expanded and modernized pulp and paper milling capacities came on stream. This contributed to the forestry sector's 2.3% annual rate of growth in employment since 1974, compared to the slight decline in the telecommunications carriers' industry.

3.2.5 Quebec

In 1983, the percentage distribution of Quebec's provincial GDP, by industry, was as follows:

Agriculture: 1.3%
Forestry: 0.4%
Fishing, Hunting and Trapping: less than 0.1%
Mining: 0.9%
Manufacturing: 19.4%
Construction: 3.6%
Electric Power, Gas and Utilities: 4.2%
Total Goods-producing: 29.8%

Education and Related Services: 6.7%
Health and Welfare: 5.8%
Accommodation and Food Service: 1.9%
Provincial and Local Governments: 4.8%
All Other Services: 51.0%
Total Service-producing: 70.2%

TABLE 3.12

Quebec: Performance Indicators
Telecommunications vs. Selected Economic Sectors

GROSS DOMESTIC PRODUCT (Constant $ 1971 millions)	1974			1979			1983			AVERAGE ANNUAL RATE OF CHANGE (%)		
	VALUE	% OF PROVINCIAL GDP[3]	% OF INDUSTRY GDP	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY GDP	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY	1974-1979	1979-1983	1974-1983
Telecommunications Carriers	440.0	1.4	20.0	725.5	1.8	22.9	884.3	2.1	23.9	10.5	5.1	8.1
Telecommunications Equipment Manufacturers	144.6	0.5	26.2	152.2	0.4	26.8	*	-	-	1.0	-	-
Forestry, Wood & Paper [1]	2,278.1	6.4	38.0	3,107.1	6.5	39.1	3,080.4	3.4	27.0	12.5	-6.9	3.4
Mining[1]	581.1	1.6	8.8	940.7	1.5	6.8	791.3	0.9	3.8	10.1	-4.2	3.5

EMPLOYMENT	1974		1979		1984				
	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	1974-1979	1979-1984	1974-1984
Telecommunications Carriers[2]	22,100	1.0	27,640	1.1	24,185	0.9	4.6	-2.6	0.9
Telecommunications Equipment Manufacturers	13,031	0.5	10,974	0.4	*	-	-3.4	-	-
Forestry, Wood & Paper	84,796	3.5	88,497	3.4	82,143	3.0	0.9	-1.5	-0.3
Mining	25,211	1.1	22,404	0.9	16,428	0.6	-2.3	-6.0	-4.2

[1] Current $ millions.
[2] Includes Bell Canada (Quebec), Quebec Tel and Telebec Ltée.
* Data withheld to meet secrecy requirements of the Statistics Act.

Source: Statistics Canada: Provincial Gross Domestic Product by Industry, Cat. No. 61-202; and Manufacturing Industries of Canada: National and Provincial Areas, Cat. No. 31-203; Energy, Mines & Resources, Annual Census of Mines, Quarries and Oil Wells, Cat. No. 26-201; and Department of Communications, Financial Statistics on Canadian Telecommunication Common Carriers, R. Jouandet-Bernadat, A. Lapointe, J.P. LeGoff, Les Communications et Le Developpment Economique, Université de Montréal, Oct. 2, 1981.

The two industries selected for comparison were forestry, wood and paper, and mining. The combined share of provincial GDP for these two industries was 4.3% in 1983 and accounted for 3.6% of total provincial employment in 1984.

a. Forestry, Wood, Paper and Allied Industries

The telecommunications carriers industry enjoyed a higher growth rate, with a 0.7 percentage point gain in provincial GDP over the last decade, while the forestry, wood and paper manufacturing industries fell by 3 percentage points (Table 3.12). Both industries are significant in the national context since Quebec's telecommunications carriers accounted for nearly 25%, and the combined forestry-related sectors almost 30%, of their respective industry's GDP in Canada in 1983. The gains in telecommunications carriers industry output were set against the rather steep decline in the forestry sector as intense competition abroad, periodic lengthy labour disputes, and lower constant dollar prices affected growth in forestry output, particularly in the early 1980's.

The latest year of data (1979) for the telecommunications equipment manufacturing industry in Quebec shows that this sector accounted for a rather insignificant 0.4% of provincial GDP compared to the forestry industry's 6.5%. Within their national respective sectors, however, both these industries in Quebec play dominant roles, accounting for about 30% of the respective industry's Canadian GDP. The growth in equipment manufacturing output was a rather sluggish 1% annual rate between 1974 and 1979, due to moderate growth in equipment demand which resulted in a small decline in its relatively insignificant share of provincial GDP from 0.5% to 0.4% by 1979. By comparison, the forestry sector increased its share of provincial GDP from 6.4% to 6.5%.

Although the combined telecommunications carriers and manufacturing sectors accounted for less than half the number of those employed in the forestry industry, the rate of employment growth was higher for telecommunications carriers (4.6% per annum) in the 1974 to 1979 period than for the forestry sector (0.9% per annum) and the telecommunications equipment manufacturing sector (-3.4% per annum). This trend, however, was reversed in the 1979 to 1984 period with telecommunications carriers labour component declining at a faster (2.6% per annum) rate than that of forestry (1.5% per annum). Changing technology favoring automation and competition were key stimulants for lower labour intensity in the telecommunications carriers industry.

b. Mining

The mining industry in Quebec continued to show a declining share of output, from 1.6% of provincial GDP in 1974 to 0.9% by 1983. At the same time, however, the telecommunications carriers sector increased its relative importance by 0.7 percentage points. The major cause of Quebec's mining industry's sluggish performance was its lack of oil and gas resources which were enjoying a boom in the Western Provinces throughout most of the last decade. In addition, worldwide demand for Quebec's principal mining commodities such as asbestos, iron ore and copper fell dramatically, beginning in the late 1970's. As constant dollar prices and production volumes declined for these minerals, so did the output value measures of gross domestic product.

The consolidation of mining capacity in Quebec's iron ore and asbestos mines also led to the long-term decline in mining employment of 4.2% per annum, compared to a 0.9% annual increase in the telecommunications carriers industry between 1974 and 1984. In fact, the combined telecommunications carriers and equipment industry exceeded the mining industry as a more significant contributor to Quebec's employment (1.5%) in spite of the drop in its employment numbers during the 1979 to 1984 period.

3.2.6 Ontario

In 1983, the percentage distribution of Ontario's provincial GDP, by industry, was as follows:

Agriculture: 1.7%
Forestry: 0.3%
Fishing, Hunting and Trapping: less than 0.1%
Mining: 1.1%
Manufacturing: 23.2%
Construction: 3.2%
Electric Power, Gas and Utilities: 2.7%
Total Goods-producing: 32.2%

Education and Related Services: 5.3%
Health and Welfare: 4.9%
Accommodation and Food Services: 2.1%
Provincial and Local Governments: 3.5%
All Other Services: 52.0%
Total Service-producing: 67.8%

The four industries selected for comparison were transportation equipment, primary metals, food and beverages, and finance, insurance and real estate. The combined share of provincial GDP for these industries was 24.0% in 1983 and they accounted for 13.3% of total provincial employment.

a. Transportation Equipment

The transportation equipment industry is more cyclical than the telecommunications carriers industry. Due to lower export demand stemming from the slower pace of economic growth in the United States during the late 1970's, output growth (3.2% per annum) in transportation equipment fell below that of the telecommunications carriers industry (3.7% per annum). Despite the strong turnaround in output in transportation equipment in the 1983 economic expansion, price competition remained intense and caused a decline in measured constant dollar output from 1979 levels. Overall, economic growth during the last decade favored the telecommunications carriers industry as investment expenditure was relatively stronger in the earlier

TABLE 3.13

Ontario: Performance Indicators
Telecommunications vs. Selected Economic Sectors

GROSS DOMESTIC PRODUCT (Constant $ 1971 millions)	1974			1979			1983			AVERAGE ANNUAL RATE OF CHANGE (%)		
	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY GDP	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY GDP	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY	1974-1979	1979-1983	1974-1983
Telecommunications Carriers	853.8	1.6	38.8	1,023.3	1.6	32.3	1,139.5	1.6	30.8	3.7	2.7	3.3
Telecommunications Equipment Manufacturers	360.8	0.8	65.4	359.5	0.6	63.3	369.6	0.7	58.0	-0.1	0.7	0.3
Transportation Equipment	2,500.7	4.4	78.4	2,923.0	3.9	71.8	2,588.1	3.9	77.5	3.2	-3.0	0.4
Primary Metals	1,168.3	2.4	59.4	1,266.4	2.4	58.6	1,003.8	1.8	56.7	1.6	-5.6	-1.7
Food & Beverages	1,340.9	2.5	42.2	1,330.4	2.6	41.3	1,441.4	2.8	44.6	1.4	2.0	1.7
Finance, Insurance & Real Estate[1]	97,816.0	11.6	12.0	108,283.0	12.9	13.7	124,672.0[2]	15.5	14.9	2.1	2.9	2.5[3]

EMPLOYMENT	1974		1979		1984				
	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	1974-1979	1979-1984	1974-1984
Telecommunications Carriers	30,200[4]	0.9	38,000	1.0	40,000	0.9	5.9[5]	1.0	3.2[6]
Telecommunications Equipment Manufacturers	27,613	0.8	24,230	0.6	30,797	0.7	-2.6	4.9	1.1
Transportation Equipment	114,121	3.2	122,961	3.1	143,855	3.4	1.5	3.2	2.3
Primary Metals	71,487	2.0	75,513	1.9	65,045	1.5	1.1	-2.9	-0.9
Food & Beverages	87,099	2.5	86,744	2.2	84,336	2.0	-.01	-0.6	-0.3
Finance, Insurance & Real Estate	132,800	3.8	237,000	5.9	272,000	6.4	12.3	2.8	7.4

[1] Current $ millions (Conference Board of Canada estimates).
[2] 1984 figure.
[3] 1974 to 1984.
[4] 1975 figure.
[5] 1975 to 1979.
[6] 1975 to 1984.

Source: Ontario Ministry of Treasury and Economics, Ontario Statistics; Statistics Canada: Manufacturing Industries of Canada: National and Provincial Areas, Cat. No. 31-203; Historical Labour Force Statistics, Cat. No. 71-001; and Conference Board of Canada, Provincial Outlook; and D.A. Ford & Associates, Study of Employment in the Communications Industry, March, 1986.

five-year period. Although relative output growth was higher in the telecommunications manufacturing industry during the later period, the long-term growth trend for both the telecommunications manufacturing industry and transportation equipment industry was roughly identical at about 0.3% annually (Table 3.13).

The growth in the telecommunications carriers sector employment was particularly strong in the 1974 to 1979 period due to plant construction, growth in demand, and the Bell Canada Non-Urban Service Improvement (NUSI) program. The rate of employment growth subsided in the telecommunications carriers industry to below that of the transportation equipment sector in the later period as automation increased efficiency and high real interest rates and competition stalled overall investment and employment growth. In telecommunications manufacturing, the employment losses in the earlier period are closely correlated with sluggish revenue growth. Terminal attachment policies, increased demand for value-added services, and expanded export opportunities for the larger equipment manufacturing firms in Ontario contributed to an almost 5% annual rate of increase in telecommunications manufacturing employment after 1979. This exceeded the 3.2% annual growth in transportation equipment industry employment during the same period.

b. Primary Metals

The primary metals' industry relies upon the demand from both consumer markets (automotive, and food and beverages) and capital goods (construction, and oil and gas) sectors for growth. Constant dollar output in the end-users' markets for primary metals in Ontario increased only gradually in the 1974 to 1979 period, followed by a severe recession in 1981 and 1982. As a result of this fluctuating economic growth, both domestically and in export markets, and foreign competition in iron and steel, the primary metals' industry underperformed both the telecommunications carriers and manufacturing industries in output and employment growth between 1974 and 1984.

c. Food and Beverages

Constant dollar output in the Ontario food and beverages industry grew at a relatively slower rate than the telecommunications carriers industry, but exceeded that of telecommunications manufacturing across all time periods. The generally sluggish growth trend for goods-producing industries and the healthier prospects for services were the major causes for the difference between the two industries. Although the food and beverages industry accounted for a higher portion of those employed in Ontario as compared to the combined telecommunications industry, consistent losses over the last decade brought the two industries' share of provincial employment much closer together, to about 2.0% each, by 1984.

d. Finance, Insurance and Real Estate

Of the four selected industries, Ontario's financial sector achieved the most sizeable advance in terms of both its relative importance within the provincial economy and its own industry over the last decade. Although

TABLE 3.14

Manitoba: Performance Indicators
Telecommunications vs. Selected Economic Sectors

GROSS DOMESTIC PRODUCT (Constant $ 1971 millions)	1974 VALUE	1974 % OF PROVINCIAL GDP^3	1974 % OF INDUSTRY GDP^3	1979 VALUE	1979 % OF PROVINCIAL GDP	1979 % OF INDUSTRY GDP	1983 VALUE	1983 % OF PROVINCIAL GDP	1983 % OF INDUSTRY	AVERAGE ANNUAL RATE OF CHANGE (%) 1974-1979	AVERAGE ANNUAL RATE OF CHANGE (%) 1979-1983	AVERAGE ANNUAL RATE OF CHANGE (%) 1974-1983
Telecommunications Carriers	132.0	2.4	6.0	177.4	2.7	5.6	192.4	2.7	5.2	6.1	2.0	4.3
Telecommunications Equipment Manufacturers	5.5	0.1	1.0	12.5	0.2	2.2	*	-	-	17.8	-	-
Mining^1	232.0	3.8	3.6	437.0	4.2	3.1	431.0	3.2	2.1	13.5	-0.3	7.1
Food & Beverages	125.1	2.7	4.6	130.9	2.6	4.1	131.4	2.4	3.7	0.9	0.1	0.5
Transportation Services^1	459.0	7.4	-	832.0	8.0	-	1,180.0	8.0	-	12.6	9.1	11.1

EMPLOYMENT	1974 NUMBER	1974 % OF PROVINCIAL EMPLOYMENT	1979 NUMBER	1979 % OF PROVINCIAL EMPLOYMENT	1984 NUMBER	1984 % OF PROVINCIAL EMPLOYMENT	1974-1979	1979-1984	1974-1984
Telecommunications Carriers	4,616	1.1	4,133	0.9	4,110	0.9	-2.2	-0.1	-1.2
Telecommunications Equipment Manufacturers	298	0.1	558	0.1	*	-	13.3	-	-
Mining	6,533	1.6	44,858	1.1	4,180	0.9	-5.8	-3.0	-4.4
Food & Beverages	11,001	2.6	10,700	2.4	9,595	2.0	-0.6	-2.2	-1.4
Transportation Services	27,208	6.5	29,475	6.6	30,600	6.5	1.6	0.8	1.2

[1] Current $ millions.

* Data withheld to meet secrecy requirements of the Statistics Act.

Source: Statistics Canada: Provincial Gross Domestic Product by Industry, Cat. No. 61-202; Manufacturing Industries of Canada National & Provincial Areas; Cat. No. 31-203; Historical Labour Force Statistics, Cat. No. 71-001; and Department of Communications, Financial Statistics on Canadian Telecommunication Common Carriers Manitoba Bureau of Statistics, Manitoba Provincial Economic Accounts, March, 1986.

Ontario's telecommunications carriers industry output growth was ahead of the financial sector overall, telecommunications carriers share of provincial GDP remained static at 1.6% since 1974. The relatively slower growth of Ontario's telecommunications carriers sector reduced its provincial contribution to the industry's national GDP from almost 39% in 1974 to 30.8% by 1983.

The favourable growth environment for the financial services sector created high rates of growth in employment opportunities which surpassed the growth rates in employment for both sub-sectors of the telecommunications industry, with the exception of telecommunications manufacturing after 1979. In absolute terms, Ontario's financial services industry employed almost four times more people than the telecommunications industry.

3.2.7 Manitoba

In 1983, the percentage distribution of Manitoba's provincial GDP, by industry, was as follows:

Agriculture: 4.4%
Forestry: 0.1%
Fishing, Hunting and Trapping: less than 0.1%
Mining: 2.2%
Manufacturing: 10.9%
Construction: 3.3%
Electric Power, Gas and Utilities: 3.6%
Total Goods-producing: 24.5%

Education and Related Services: 5.8%
Health and Welfare: 5.5%
Accommodation and Food Services: 2.6%
Provincial and Local Governments: 4.4%
All Other Services: 57.2%
Total Service-producing: 75.5%

The three industry sectors selected for comparison to telecommunications were mining, transportation services, and food and beverages. These three sectors accounted for more than 10% of provincial GDP in 1983 and 9.4% of total provincial employment in 1984.

a. Mining

Manitoba's mining industry's share of provincial output fell below that of the telecommunications carriers industry in 1983 after enjoying a share of almost twice the amount in 1974 and 1979 (Table 3.14). A nine-month shutdown of Manitoba's important nickel operations, which ended in April, 1983, however, distorted the value of total mineral outputs in that year. The combined telecommunications carriers and equipment manufacturing's share of provincial GDP rose from 2.5% to 2.9% between 1974 and 1979, while mining increased by only 0.3 percentage points as a result of continued weakness in major commodities such as nickel, copper and zinc.

Mining employment declined more rapidly in the late 1970's (-5.8% per annum) than that of the telecommunications carriers industry (-2.2% per annum). The growing electronics industry in Manitoba accelerated telecommunications equipment manufacturing employment to a rapid 13.3% annual rate. Telecommunications carriers employment growth has stabilized since 1979, while mining industry investment remains low, reflecting the overall weakness in the world minerals market. This has led to a steady rationalization of mining employment in Manitoba coupled with cost containment and productivity improvements.

b. Food and Beverages

The rate of output growth in the food and beverages industry was much slower than that in the telecommunications carriers and equipment manufacturing industries. The traditional reliance on the cyclical agricultural sector which experienced periodic weather-related interruptions of supply, coupled with plant closures in the meat processing industry, led to a weak 0.5% long-term rate of output growth. The food and beverages sector's share of provincial GDP (2.6%) also fell below that of the telecommunications industry (about 3%) as of 1979.

Flat output growth in the food and beverages industry after 1979 was the basis for a quickened pace of decline in the industry's employment which exceeded the small loss recorded in the telecommunications carriers' industry. Nonetheless, Manitoba's food and beverages industry employed about twice the number of people than the telecommunications industry.

c. Transportation Services

The transportation industry is a dominant sector of the Manitoba economy, accounting for 8.0% of provincial GDP in 1979 and 1984. By comparison, the combined telecommunications industry was only one-third the size of the transportation industry in 1974, but had closed the gap slightly by 1979. The central location of Manitoba and, in particular, Winnipeg, serves as a major transfer point for goods moving east or west. The importance of transportation services to Manitoba is enhanced by the location of large service centers for both Air Canada and Canadian National Railways as well as the head offices of some 60% of the country's trucking companies. Because reported GDP is based on a different dollar base for telecommunications (constant dollars) and transportation services (current dollars), the comparison in rates of growth is not possible. Nonetheless, the combined telecommunications industry raised its share of provincial GDP between 1974 and 1979 from 2.5% to 2.9%. At the same time, transportation services increased its relative share from 7.4% to 8.0%. Available data on the telecommunications services industry suggest that there was little or no growth in the relative provincial GDP shares for either the telecommunications carriers or transportation services industries between 1979 and 1983.

TABLE 3.15

Saskatchewan: Performance Indicators
Telecommunications vs. Selected Economic Sectors

GROSS DOMESTIC PRODUCT (Constant $ 1971 millions)	1974			1979			1983			AVERAGE ANNUAL RATE OF CHANGE (%)		
	VALUE	% OF PROVINCIAL GDP[3]	% OF INDUSTRY GDP[3]	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY GDP	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY	1974–1979	1979–1983	1974–1983
Telecommunications Carriers	83.6	1.5	3.8	91.9	1.3	2.9	103.6	1.3	2.8	1.9	3.0	2.4
Telecommunications Equipment Manufacturers	*	–	–	*	–	–	*	–	–	–	–	–
Agriculture	1,719.0	29.3	31.6	1,713.0	16.5	22.3	1,530.0	13.0	23.1	-0.7	-2.2	-1.2
Mining[1]	421.0	6.7	6.1	1,025.0	9.4	7.3	2,129.0	13.1	7.3	19.5	15.7	17.6

EMPLOYMENT	1974		1979		1984				
	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	1574–1979	1979–1984	1974–1984
Telecommunications Carriers	2,974	0.8	4,079	1.0	4,525	1.0	6.5	2.1	4.3
Telecommunications Equipment Manufacturers	*	–	*	–	*	–	–	–	–
Agriculture	160,000	30.3	98,000	23.8	89,000	20.3	-1.6	-1.9	-1.7
Mining	5,291	1.5	6,726	1.6	7,537	1.7	4.9	2.3	3.6

[1] Current $ millions.

* Data withheld to meet secrecy requirements of the Statistics Act.

Source: Government of Saskatchewan, Saskatchewan Economic Statistics; Statistics Canada: Provincial Gross Domestic Product by Industry, Cat. No. 61-202; Energy, Mines & Resources, Annual Census of Mines, Quarries and Oil Wells, Cat. No. 26-201; and Department of Communications, Financial Statistics on Canadian Telecommunication Common Carriers.

In terms of employment, the rate of increase in transportation employment was higher (1.6% annually) during the 1974 to 1979 period when the West prospered, and was comparatively stronger than the 2.2% annual decline recorded by the telecommunications carriers industry in the same period. Transportation services employment, however, did not match the extraordinary annual growth rate of 13.3% which the small base of telecommunications equipment manufacturing employment enjoyed during the late 1970's. Overall, despite a rate of employment growth after 1979 of only half the rate of the earlier period, transportation remains as a dominant employer in Manitoba, accounting for a consistent 6.5% of those employed within the province over the entire decade.

3.2.8 Saskatchewan

In 1983, the percentage distribution of Saskatchewan's provincial GDP, by industry, was as follows:

Agriculture: 14.2%
Forestry: 0.2%
Fishing, Hunting and Trapping: less than 0.1%
Mining: 10.1%
Manufacturing: 4.7%
Construction: 5.7%
Electric Power, Gas and Utilities: 2.1%
Total Goods-producing: 37.1%

Education and Related Services: 5.5%
Health and Welfare: 4.9%
Accommodation and Food Services: 2.2%
Provincial and Local Governments: 4.9%
All Other Services: 45.4%
Total Service-producing: 62.9%

The two industries selected for comparison in Saskatchewan were agriculture and mining. Combined, these industries accounted for 26.1% of provincial GDP in 1983 and accounted for 22.0% of total provincial employment.

a. Agriculture

Agricultural output in Saskatchewan, as shown in Table 3.15, declined in constant dollar terms throughout the last decade (1.2% annual rate of decline) while the telecommunications carriers industry grew consistently at a 2.4% annual rate. Cyclical fluctuations, adverse weather conditions, generally lower prices for farm products and crops (particularly during the 1979 to 1983 period) all combined to restrain growth in agricultural output. The telecommunications carriers industry in Saskatchewan launched a drive towards improving rural services after implementing a fibre-optic transmission network in the late 1970s which subsequently led to higher output as demand for services grew. The hardships in agriculture were highlighted in the sharp decline in agriculture's share of provincial GDP which fell from 29.3% in 1974 to 13.0% in 1983, compared to 1.5% to 1.3% of provincial GDP in the telecommunications carriers industry in the same period.

The westward migration of population during the late 1970s and a dedicated effort to pursue the latest technology resulted in new investment in Saskatchewan's telecommunications infrastructure. As a result, telecommunications employment growth was strong, averaging 6.5% during the 1974 to 1979 period, followed by a 2.1% annual growth rate over the period 1979 to 1984. As the agricultural sector increased its level of capital intensity while actual returns began to fall, total agricultural employment fell throughout the decade at a 1.7% annual rate of decline. Nonetheless, in 1984, agriculture still accounted for over 20% of those employed in the province, while the carriers industry accounted for only a 1% share.

b. Petroleum and Mining

The growing share of provincial GDP accounted for by the mining industry in Saskatchewan (which almost doubled, from 6.7% in 1974 to 13.1% in 1983), stemmed from the increasing level of production and value of its chief minerals of oil, potash and, to some extent, uranium. Thus, in relative terms, the growth in telecommunications was less rapid, as witnessed in the slight decline in the communications carriers industry's share of provincial GDP.

Although mining output growth exceeded that of the telecommunications industry, the growth in mining employment was slower in comparison. Following a near 5% average annual rate of growth in mining employment in the oil-boom days of the 1970s, growth subsided to a 2.3% annual rate as overall energy sector investment was reduced, primarily as a result of softening prices for crude oil, significantly lower world prices for potash, and the closure of Uranium City operations by Eldorado Nuclear Ltd. in 1983.

3.2.9 Alberta

In 1983, the percentage distribution of Alberta's provincial GDP, by industry, was as follows:

Agricultrure: 3.1%
Forestry: less than 0.1%
Fishing, Hunting and Trapping: less than 0.1%
Mining: 32.0%
Manufacturing: 5.8%
Construction: 5.7%
Electric Power, Gas and Utilities: 2.1%
Total Goods-producing: 48.9%

TABLE 3.16

Alberta: Performance Indicators
Telecommunications vs. Selected Economic Sectors

GROSS DOMESTIC PRODUCT (Constant $ 1971 millions)	1974			1979			1983			AVERAGE ANNUAL RATE OF CHANGE (%)		
	VALUE	% OF PROVINCIAL GDP[3]	% OF INDUSTRY GDP[3]	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY GDP	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY	1974-1979	1979-1983	1974-1983
Telecommunications Carriers	191.5	1.3	8.7	345.3	1.6	10.9	395.9	1.5	10.7	12.5	3.5	8.4
Telecommunications Equipment Manufacturers	6.1	0.05	1.1	8.5	0.04	1.5	20.4	0.1	3.2	6.9	24.5	14.4
Mining, Oil and Gas[1]	2,757.0	20.4	42.9	7,723.0	23.5	50.4	15,113.0	32.0	69.8	22.9	14.4	18.5

EMPLOYMENT	1974		1979		1984				
	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	1974-1979	1979-1984	1974-1984
Telecommunications Carriers[2]	9,861	1.3	12,006	1.2	12,917	1.2	4.0	1.5	2.7
Telecommunications Equipment Manufacturers	411	0.1	672	0.1	*	–	10.3	–	–
Mining, Oil and Gas	18,614	2.5	25,507	2.5	36,754	3.3	6.5	7.6	7.0

[1] Current $ millions.
[2] Includes Alberta Government telephones and Edmonton telephones.
* Data withheld to meet secrecy requirements of the Statistics Act.

Source: Alberta Bureau of Statistics, Alberta Statistical Review; Energy, Mines & Resources, Annual Census of Mines, Quarries and Oil Wells, Cat. No. 26-201; and Department of Communications, Financial Statistics on Canadian Telecommunication Common Carriers.

Education and Related Services: 4.0%
Health and Welfare: 3.6%
Accommodation and Food Services: 1.9%
Provincial and Local Governments: 4.2%
All Other Services: 37.4%
Total Service-producing: 51.1%

The industry selected for comparison was the mining and petroleum sector which accounted for 32% of provincial GDP in 1983 and 3.3% of total provincial employment in 1984.

a. Petroleum and Mining

Both price and output increases for oil, natural gas and coal during the 1974 to 1979 period, combined with an accommodating provincial royalty and corporate tax system to counter federal tax changes, spurred a rapid growth of economic activity in Alberta. Alberta's overall share of provincial output, capital investment and employment increased at the highest rate for all provinces in the late 1970s which led to a quickened pace in developing telecommunications services as demand for them rose.

The growth of the telecommunications carriers industry share of provincial GDP, however, was dwarfed by the strong growth in mining which rose from less than 20% in 1974 to just under one-third of the province's total economic output by 1983 (Table 3.16). The rate of growth in mining GDP, in current dollar terms, showed a decline from 22.9% in the 1974 to 1979 period to 14.4% in 1979 to 1983.

A chief cause for the reduced output growth can be attributed to high interest rates in the early 1980s, coupled with the introduction of the federal National Energy Program (NEP) which curtailed production of oil and gas for a period of time. The NEP increased the regional redistribution of energy revenues as the proceeds of new energy taxes (e.g., the Petroleum Gas and Revenue Tax) were used to finance energy conservation schemes and stimulate frontier energy development in the Arctic and Atlantic offshore rather than in conventional areas in Alberta. High interest rates resulted in the shelving of energy megaprojects and growth and investment in the oil-based economies such as Alberta slackened off considerably, employment declined, and net inward migration of population fell. This was a major contributing factor to the decline in telecommunications carriers industry output growth, from a 12.5% annual rate between 1974 and 1979 to only 3.5% between 1979 and 1983.

The Alberta telecommunications equipment manufacturers benefited in particular from the preferences for provincially manufactured equipment of the government-owned service providers, Alberta Government Telephones, and 'edmonton tel'. The output growth in equipment manufacturing was strong, averaging 24.5% per annum between 1979 and 1983 as a result of large national companies such as Northern Telecom and NovAtel establishing plants in the province. Within the province, however, telecommunications equipment manufacturing accounted for only 0.1% of provincial GDP in 1983, but doubled in 1984.

TABLE 3.17

British Columbia: Performance Indicators
Telecommunications vs. Selected Economic Sectors

GROSS DOMESTIC PRODUCT (Constant $ 1971 millions)	1974			1979			1983			AVERAGE ANNUAL RATE OF CHANGE (%)		
	VALUE	% OF PROVINCIAL GDP[3]	% OF INDUSTRY GDP[3]	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY GDP	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY	1974-1979	1979-1983	1974-1983
Telecommunications Carriers	250.9	1.6	11.4	332.7	1.6	10.5	432.9	2.0	11.7	5.8	6.8	6.2
Telecommunications Equipment Manufacturers	18.8	0.1	3.4	17.0	0.1	3.0	*	-	-	-2.0	-	-
Forestry[1]	558.4	3.2	50.2	1,188.3	3.6	58.6	1,304.9	2.8	56.2	16.3	2.4	9.9
Mining[1]	631.0	3.7	9.2	1,608.1	4.9	10.8	1,268.0	2.7	5.7	20.6	-5.8	8.1

EMPLOYMENT	1974		1979		1984				
	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT	1974-1979	1979-1984	1974-1984
Telecommunications Carriers	13,999	1.4	13,943	1.2	14,146	1.2	-0.1	0.3	0.1
Telecommunications Equipment Manufacturers	1,585	0.2	1,605	0.1	*	-	0.3	-	-
Forestry	22,100	2.3	24,700	2.2	19,223	1.6	2.2	-4.9	-1.4
Mining	12,597	1.3	12,237	1.1	13,206	1.1	-0.6	1.5	0.5

[1] Current $ millions.

* Data withheld to meet secrecy requirements of the Statistics Act.

Source: Statistics Canada: Provincial Gross Domestic Product by Industry, Cat. No. 61-202; Employment, Earnings & Hours, Cat. No. 71-002; Energy, Mines and Resources, Annual Census of Mines, Quarries & Oil Wells, Cat. No. 26,201; and Department of Communications, Financial Statistics on Canadian Telecommunication Common Carriers.

Although investment expenditures and employment grew in the mining industry in the 1970s, the rate of increase in employment in Alberta's telecommunications equipment manufacturing sector was higher, while employment growth in the telecommunications carriers industry was only slightly lower. Mining employment continued to expand in the 1980s, but telecommunications carriers employment growth had become more stable as service demand slowed, while automation and labour productivity improvement programs reduced the need for more labour. Both the rate of employment growth and the share of the province's employment accounted for by Alberta's mining industry was much stronger than that of the telecommunications industry in the province.

3.2.10 British Columbia

In 1983, the percentage distribution of British Columbia's provincial GDP, by industry, was as follows:

Agriculture: 1.2%
Forestry: 2.8%
Fishing, Hunting and Trapping: 0.3%
Mining: 2.7%
Manufacturing: 12.4%
Construction: 4.9%
Electric Power, Gas and Utilities: 2.6%
Total Goods-producing: 26.9%

Education and Related Services: 5.0%
Health and Welfare: 5.4%
Accommodation and Food Services: 3.0%
Provincial and Local Governments: 3.8%
All Other Services: 55.9%
Total Service-producing: 73.1%

The two industries selected for comparison in British Columbia were forestry and petroleum and mining. These industries accounted for 5.5% of provincial GDP and 2.7% of total provincial employment.

a. Forestry

During the 1974 to 1979 period, British Columbia's forestry industry benefited from rising lumber demand in the United States and growing exports to Japan. Growth in demand and prices, however, was not maintained in the later five-year period, mostly as a result of the 1981 to 1982 recession, which greatly reduced construction activities domestically and in the United States. By 1983, lumber output had recovered to only two-thirds of the pre-recession levels (Table 3.17).

Telecommunications carriers' output growth remained flat as a share of provincial GDP (1.6%) between 1974 and 1979, while the forestry sector gained 0.4 percentage points, rising from 3.2% to 3.6% of provincial GDP. The cyclical forestry sector subsequently lost ground in the later period by falling to only 2.8% of provincial GDP in 1983. But, an average 6.8% annual rate of output growth in telecommunications carriers output contributed to an increase in the industry's share of provincial GDP, rising to 2.0% by 1983. Output of the telecommunications equipment manufacturing industry declined in the late 1970s as other Western Provinces such as Manitoba and Alberta showed more rapid advances, but maintained a relatively stable share of provincial GDP at an insignificant 0.1%.

Employment growth in both sub-sectors of the telecommunications industry during the late 1970s did not match the relatively stronger 2.2% annual gains in forestry industry employment. Over the entire decade, however, the forestry industry performed poorly, recording a 4.9% average rate of decline in employment in the 1979 to 1984 period, and a 1.4% long-term average rate of decline since 1974. The telecommunications carriers industry at least grew at a 0.1% rate over the decade and recorded a relatively smaller decline in the share of provincial employment compared to the decline in share from 2.3% to 1.6% in the larger forestry sector.

b. Petroleum and Mining

As part of the resources sector, growth in the petroleum and mining industry in British Columbia paralleled the market trend in the forestry sector - a rapid run-up in the late 1970s followed by a pronounced downturn in output between 1979 and 1983. Therefore, the sustained growth in the telecommunications carriers industry improved the industry's relative importance within the British Columbia economy by 1983. The growth in mining sector output during the 1970s was due to strong gains in coal, natural gas and base metals (copper, molybdenum, lead and zinc) production. But changing steel manufacturing processes and worldwide excess capacity in base metals and coal lowered constant dollar prices for these commodities after 1980, which subsequently constrained the growth in the value of output.

Despite the growth in mining output in the 1974 to 1979 period, total mining employment declined at a faster rate than in either of the telecommunications sub-sectors. The 1.5% annual rate of increase in mining employment in the later period as a result of expanded metallurgical coal mining capabilities was much higher than the 0.3% annual rate of employment growth in the telecommunications carriers industry over the same period. At 1.2%, the telecommunications carriers industry also accounted for a higher share of provincial employment than the mining industry, at 1.1%, in 1984.

3.2.11 Yukon and Northwest Territories

In 1983, the percentage distribution of the Yukon and Northwest Territories territorial GDP, at factor cost, by industry, was as follows:

TABLE 3.18

Yukon and Northwest Territories: Performance Indicators
Telecommunications vs. Selected Economic Sectors

GROSS DOMESTIC PRODUCT (Constant $ 1971 millions)	1974			1979			1983			AVERAGE ANNUAL RATE OF CHANGE (%)		
	VALUE	% OF PROVINCIAL GDP[3]	% OF INDUSTRY GDP[3]	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY GDP	VALUE	% OF PROVINCIAL GDP	% OF INDUSTRY	1974-1979	1979-1983	1974-1983
Telecommunications Carriers	N.A.	-	-	N.A.	-	-	N.A.	-	-	-	-	-
Telecommunications Equipment Manufacturers	-	-	-	-	-	-	-	-	-	-	-	-
Mining[1]	153.3	31.2	2.2	263.7	29.9	1.8	241.5	16.3	1.1	11.5	-2.2	5.2
Tourism[2]	13.1	3.6	0.5	16.0	3.5	0.5	14.2	2.6	0.5	4.1	-3.0	0.9
Government[3]	26.7	7.8	0.8	32.3	10.0	0.8	41.5	11.1	0.9	3.9	6.5	5.0
	1974			1979			1984					
EMPLOYMENT	NUMBER	% OF PROVINCIAL EMPLOYMENT		NUMBER	% OF PROVINCIAL EMPLOYMENT		NUMBER	% OF PROVINCIAL EMPLOYMENT		1974-1979	1979-1984	1974-1984
Telecommunications Carriers[4]	550	4.2		550	4.0		485	1.9		0.0	-2.5	-1.2
Telecommunications Equipment Manufacturers	-	-		-	-		-	-		-	-	-
Mining	2,960	22.5		3,441	24.8		3,877	14.8		3.1	2.4	2.7
Tourism[5]	2,117	16.1		2,668	19.2		1,873	7.2		4.7	-6.8	-1.2
Government[3]	4,650	35.4		4,677	33.7		5,536	21.2		0.1	3.4	1.8

[1] Current $ millions.
[2] Accommodation & Food Services.
[3] Territorial & Local Administration combined.
[4] Northwest Tel
[5] Includes full-time and part-time employees at all hotels.
N.A. Not available

Note: Due to a change in the survey method by Statistics Canada in April 1983, the sectoral shares of employment in 1984 is not directly comparable to previous years shown.

Source: Statistics Canada: Provincial Gross Domestic Product by Industry, Cat. No. 61-202; Provincial & Territorial Government Employment, Cat. No. 72-007; Employment, Earnings & Hours, Cat. No. 72-002; Census of Canada Labor Force Industry Trends, Cat. No. 92-925; Energy, Mines & Resources, Annual Census of Mines, Quarries & Oil Wells, Cat. No. 26-201; and Traveller Accommodation Statistics, Cat. No. 63-204 (Annual), Northwest Tel, Annual Reports.

Agriculture: 0.0%
Forestry: 0.0%
Fishing, Hunting and Trapping: 0.2%
Mining: 16.3%
Manufacturing: 0.9%
Construction: 23.2%
Electric Power, Gas and Utilities: 3.6%
Total Goods-producing: 44.2%

Education and Related Services: 4.5%
Health and Welfare: 2.7%
Accommodation and Food Services: 2.6%
Provincial and Local Governments: 11.1%
All Other Services: 34.9%
Total Service-producing: 55.8%

The three industries selected for comparison to telecommunications were mining, tourism, and government services. Combined, these industries accounted for 30% of the territories' GDP and about 40% of total territorial employment.

a. Mining

Statistics Canada does not report on the level of telephone activities in the territories separately which precluded the application of the analytical approach used in previous sections of this report and, thus, limits the comparative analysis for this region.

Mining employment growth in the Yukon and Northwest Territories (Table 3.18) was led by expanding base and precious metals mining as well as natural gas (Mackenzie River) in the 1970's, and provided an increase in mining's share of territorial employment. In the early 1980's, Arctic explortion for oil and gas (Beaufort Sea) was encouraged by the Petroleum Incentives Program and sustained employment. Using NorthwestTel's employment as a proxy for the entire region, telecommunications carriers employment was static in the 1974 to 1979 period and showed a 2.5% decline in the 1979 to 1984 period as a result of implementing digital switches and centralizing operator functions. This resulted in a much slower rate of growth in employment than that of the mining industry overall. There is no telecommunications manufacturing industry located in the region.

b. Tourism

No output measure is available for the tourism industry for comparison to the telecommunications carriers industry.

The tourism industry was a significant employer in the 1974 to 1979 period and recorded a 3.1% annual rate of increase. This helped to boost the territorial tourism employment share from 16.1% to 19.2% in the first five-year period while telecommunications carriers employment was static and lost shares by a marginal amount from 4.2% to 4.0%. The change in Statistics Canada's demographic and employment survey methodology in 1983 distorts the analysis from 1979 to 1984 in terms of provincial employment shares. Nonetheless, total tourism employment recorded a 6.8% annual rate of decline while network automation and centralization of some operator functions contributed to only a 2.5% annual rate of employment decline at NorthwestTel. Despite falling employment in both sectors, territorial tourism employment in 1984 maintained its traditional dominance of about four times more than the telecommunications carriers employment since 1974.

c. Government

No output measure for the government sector is available for comparison with the telecommunications carriers industry.

In terms of employment growth, the rates of increase of both NorthwestTel (no change) and the government sector (0.1% annually) were basically flat from 1974 to 1979. The territorial governments increased spending and relative importance to the local economy during the 1979 to 1984 period, and government sector employment grew at an annual 3.4% rate. Overall, the government sector remained the dominant employer, with between 21.2% and 35.4% of total territorial employment during the last decade in spite of the change in employment survey methodology in 1983.

3.2.12 Summary

The comparative analysis of the telecommunications industry and selected key industries at the provincial level revealed the following observations on a regional basis:

- Atlantic Canada. Most of the industries selected for comparison were in the goods-producing sector, including fishing, agriculture, mining, forestry and food and beverages. The collective share of provincial GDP for the selected industries represented a relative low of 6.9% (in Nova Scotia in 1984) to 11.0% (in Prince Edward Island and New Brunswick in 1983).

  The telecommunications carriers industry's output grew at a faster rate in the Atlantic Provinces than in all selected industries between 1974 and 1983, with the exception of transportation services in Nova Scotia. The rate of employment growth in the Atlantic telecommunications industry, however, fell short of all the major industries selected for comparison, with Newfoundland's mining and Prince Edward Island's agricultural sectors being the only two exceptions.

- Central Canada. The selected sectors for comparison in Quebec and Ontario were dominated by goods-producing industries such as forestry and wood products, mining, transportation equipment, food and beverages, and primary metals. The two selected sectors in Quebec accounted for 4.3% of provincial GDP in 1983 while the four sectors in Ontario accounted for nearly one-quarter of provincial GDP that same year.

In the telecommunications carriers industry, output growth outperformed most of the selected industries with the exception of the finance, insurance and real estate sector in Ontario. The region led the structural shift from manufacturing to service industries as sectors of leading economic performance. Telecommunications carriers employment growth, which moderated in Central Canada during the 1979 to 1984 period, still exhibited a stronger growth rate over the 1974 to 1984 period than all selected industries, with the exception of Ontario's financial sector.

Changing technology and a modest level of growth in export sales for the telecommunications manufacturers in Central Canada led to weak output growth and employment declines during the 1974 to 1979 period. Available statistics show that output growth in Ontario's telecommunications manufacturing sector during the 1979 to 1984 period was stronger and exceeded the output growth of two of the selected industries - transportation equipment and primary metals. Employment growth in Ontario's telecommunications manufacturing sector during the 1979 to 1984 period was even stronger, and exceeded the record in all the selected industries. Significantly higher revenues as a result of leading edge technology in the export market contributed to the gains in equipment manufacturing during this period.

- Western Canada. The region's economy is dominated in terms of Canada's resource industries such as mining and petroleum, forestry, and agriculture.

  In general, the comparative analysis showed that the telecommunications carriers industry's output growth exceeded the growth in the agricultural and forestry sectors in Saskatchewan and British Columbia and transportation services in Manitoba, but lagged the mining and petroleum sectors in Alberta and Saskatchewan. Employment in the telecommunications carriers industry also grew faster than that of the selected industries except in the territories, Manitoba's transportation industry, and the mining sectors in both Alberta and British Columbia over the entire 1974 to 1984 period.

  In the telecommunications manufacturing sector, available data suggest that there were rapid advances in both Manitoba and Alberta in both employment and output growth, but the absolute size of the respective industries remains small.

3.3 Technology Has Facilitated Low-cost Delivery of Services and Increased Capital Investment

During the 1971 to 1985 period, the telecommunications and electronics industries have converged. This has been a global trend which has resulted in the development and introduction of new generations of telecommunications equipment embracing both telecommunications and computers.

The fundamental breakthrough in the world's telecommunications technology came from the electronics industry's transitor in 1946. The development of the transistor set the stage for "pulse code modulation" (PCM), which transformed the traditional analog telephone signal into a digital signal which could be accommodated both technologically and, more importantly, economically. Following the transitor came succeeding generations of technologies - discrete electronics, integrated circuits, large scale integration (LSI) and very large scale integration (VLSI). These devices not only blurred the traditional boundaries between switching, inter-office and loop technology, but permitted the integration of network components and supporting fields (such as the computer) to develop as key design concepts of today. They also had major impacts on long haul technology (switches) and economics.

The spillover effects have resulted in the development of many telecommunications products or systems, including:

- Semi-conductors and Integrated Circuits
- Digital Switching Equipment
- Fibre Optics
- Office Network Communications
- Cellular Mobile Radio
- Satellites
- Public Data Networks

Each of these products has affected the telecommunications industry, as described in the subsequent sections. The newer technologies have generally led to fewer equipment requirements due to miniaturization, lower real operating costs, and greater reliability. For example, digital switching technology combined with digital transmission have lowered the average cost per network circuit. Capital investment has been sustained with the changing technology requirements, since the telcos buy new equipment before existing material has been fully depreciated. At the same time, traditional services have been enhanced and new service options expanded.

a. Semi-conductors and Integrated Circuits

The development of semi-conductors and integrated circuits has led to large scale integration (LSI), one of the most important circuitry designs of today. Integrated circuits allowed the price per circuit function to decrease steadily, by increasing the number of functions in a single chip, thus further reducing circuit size, power consumption and connection requirements. It has allowed carriers and manufacturers to develop products which have reduced maintenance needs, space requirements and heat dissipation, improved up-time, and reduced overall maintenance costs. Custom LSI devices are now present in all modern transmission equipment such as pulse-code modulation systems, analog/digital code converters, modems, and multiplexors.

b. Switching Equipment

In the switching sector, the introduction of integrated circuits with programmed functions has not only reduced the physical size of switches but has also enabled stored program control (SPC) switching systems to compete with non-computerized control systems. Moreover, digital technology combined with the advances of PCM and SPC to provide integrated digital networks, using both digital switching and transmission. Integrated systems have lower installation and operating costs, particularly for large telephone networks. The industry is currently moving towards the adoption of Integrated Services Digital Networks (ISDN) which create broadband, digital communication that delivers voice, data and image services, and makes traditional telecommunication and data processing more compatible.

c. Fibre Optics

The early 1980s can be described as an important period which saw the development and implementation of fibre optics communication networks. As information is carried by light pulses travelling through glass, fibre optic cables have the advantage of immunity to electromagnetic interference and cross-talk, compared with the conventional copper wire. Fibre optics also offer more band width and greater channel capacity. Canada has been among the world leaders in R&D in fibre optics development.

Regionally, SaskTel launched the first large scale investment in fibre-optics, with its modernization of the provincial network in 1980. Features such as the low cost expansion of capacity, reduced components and systems costs, potential for capacity and technological improvements were the main attractive features in the SaskTel decision. All telcos, as well as CNCP Telecommunications, have introduced substantial amounts of fibre optics into their networks.

d. Office Network Communications

Office network communications are closely aligned to the concepts of office automation and integrated office systems. The initial costs of an integrated data environment have the potential to be offset by increasing productivity through resource-sharing. There are several systems which exist today such a coaxial-based local area networks although still in its infancy, (LANs) and voice/data PABX (private automated branch exchange systems). The evolution in LANs has been dramatic in recent years. Currently, the LANs technology is capable of integrating all devices - disks, printers, tapes, terminals and telecommunication channels - to provide data communications within a building or a group of buildings. The PBX is a switch and can use a LAN which connects the various devices as the user wishes, i.e., a phone call will be connected to a PBX phone, and a terminal communication will be switched to a PBX connected terminal. PBXs are simple, easy to connect, and cost-effective for any additional terminals, once installed. Voice and data switching on PBX has not generally sold well due to cost.

e. Mobile Communications

The first important use of mobile communications dates back to 1921 with the Detroit Metropolitan Police in the United States, using high frequency (HF) band with awkward and bulky equipment. The rapid annual growth rate of mobile communications by the late 1970s created congestion in the allocated spectrum in certain areas, especially in the large urban centres, and new methods for more efficient spectrum use became necessary. The cellular concept came out of Bell Laboratories in 1947, but was not pursued until 1974, when the United States Federal Communications Commission allocated 40 MHz of spectrum for cellular systems and approved Illinois Bell's application to test the system in Chicago in 1978.

This technology uses low-powered transmitters to serve small geographic areas called a cell, hence the term cellular. The cellular configuration allows low-powered frequencies to be re-used by different mobiles passing through the cell at different times, and thereby avoiding congestion. The cellular mobile switch is further linked to the regular public telephone network through the base radio stations serving the cells.

The first commercial cellular system was established in the Scandinavian countries of Sweden, Norway, Denmark and Finland in 1981. In Canada, the Department of Communications granted a duopoly for cellular mobile communications service in 1983, whereby an independent company (Cantel Inc.) was given the right to set up a cellular system across Canada, while Bell, B.C. Tel., provincial and local telephone companies were allowed to compete in their respective areas. The first Canadian cellular mobile phone system began operation in July, 1985.

Cellular service has not yet been introduced in all provinces. Cantel has not yet made application to interconnect with the provincial or local telephone networks in all areas due to limited demand and federal authorities have not provided cellular licenses to the local telcos. Service is currently available in Alberta, British Columbia, Ontario, Quebec and Nova Scotia. Both Cantel and the Manitoba Telephone System are expected to commence cellular operation in Winnipeg in May, 1988. The competition to Cantel in these provinces includes B.C. Tel., 'edmonton telephones', AGT, MT&T Bell Cellular in Quebec and Ontario, and MTS.

The primary subscribers to this rather expensive service (phone equipment prices range from $1,700 to $4,500 and an average $120 monthly user charge) are business people who travel frequently and need to communicate outside the office. The fact that market penetration is increasing provides a strong indication that, at least for some segments of the business community, cellular telephone provides direct cost savings over alternatives made up of staff time loss and additional transportation or travel costs.

f. Satellite Communications

The use of satellites has significantly increased available transmission capacity. An important characteristics is that it has made long distance transmission costs relatively insensitive to distance. The technology itself, however, does include some shortcomings such as transmission delays. The delays make echo cancellation on two-way circuits technically difficult and tend to be objectionable to users. Satellite circuits are also subject to atmospheric interference which leads to errors on data circuits.

Satellite communications and manufacturing technology originated from the successful Allouette Ionospheric studies program between the Canadian Defense Research Board and NASA in 1958. Throughout the 1960s, Canadian telecommunications carriers proposed to the federal government the establishment of a domestic satellite system. Satellites were deemed the most cost efficient method to provide good quality telecommunications services to the north, where other means would be cost prohibitive due to distance and the terrain. At the same time, microwave transmission capacities in the south, where there is heavy traffic volume, could be supplemented.

Telesat Canada was formed in 1969 as a corporation, jointly owned by the federal government and the carriers, with a monopoly to provide satellite communications in Canada. Total federal government loans and equity reached $40 million between 1960 and 1977, which was combined with a $30 million equity stake from the carriers. The federal government was also involved in initial marketing, with funding provided to the CBC to lease channels. By 1977 sales did not materialize, and the lack of revenue eroded Telesat's ability to commission a new generation of satellites and prompted a proposal for Telesat to enter Telecom Canada, then the Trans Canada Telephone System (TCTS). The intent was to smooth out the cyclical nature of Telesat's earnings created by its "lumpy investment" requirements. The agreement called for Telesat to credit TCTS during the points of the investment cycle when earnings were high. The proposal was originally denied by the CRTC over concerns of concentration in the industry. This was reversed by an Order in Council, reflecting the Government's concerns over the provision of services to remote communities and the procurement of new satellites.

Throughout the development of space communications, the federal government strongly supported the indigeneous satellite manufacturing industry with development contracts and test facilities as well as programs to ensure a high Canadian content. Within a decade, Canadian content in the ANIK satellites rose from 14% in ANIK A to 50% for ANIK D.

g. Public Data Networks

Canada introduced the world's first point-to-point high speed data service, DATAROUTE, in 1973 in response to the rapidly expanding business data communication needs of the early 1970s. Two factors were key to the development - quality of service and cost. As Telecom Canada members

TABLE 3.19

Capital Investment of Telecommunications

	1971	1975	1980	1981	1982	1983	1984	1985
Capital Investment								
• Plant (constant 1981 $ mill.)	719.1	866.7	1,066.4	1,013.1	912.8	640.2	642.8	678.9
Avg. annual rate of Change (%)	–	4.8	4.2	-5.0	-9.9	-30.0	0.4	5.6
• Maintenance and Equipment (constant 1981 $ millions)	857.7	1,382.5	1,685.7	1,970.4	1,907.4	1,548.7	1,631.5	1,586.9
Avg. annual rate of Change (%)	–	12.7	4.0	16.9	-3.2	-18.8	5.3	-2.7

began to modernize their basic internal transmission facilities during the early to mid-1970s from analog to digital, concerns on long-haul data transmission quality and cost were addressed.

The current phase of development focusses on Integrated Services Digital Network (ISDN) which digitalizes all voice and data for digital transmission and switching, common channel signalling, digital access loops, and a set of public standards for users to access those capabilities. The industry is pursuing world ISDN standards. The potential advantages from ISDN include a complete voice and data delivery service using existing transmission and distribution networks.

3.3.1 The Impact of Technological Change on the Telecommunications Industry

The technological advancements in telecommunications has affected the industry in the areas of network switching and transmission as well as in merging with computer technologies. As the report on the Federal Provincial Examination of Telecommunications Pricing (1986) indicates, the additions of fibre optics, coaxial cable, satellites, digital switching etc., have raised productivity and greatly reduced unit costs of operation. It is this reduced cost structure for switching and transmission and the proliferation of computer technology which stimulated the potential for market entry by entrepreneurs from manufacturing to service provision.

The general consequences of technological change are summarized as follows:

- Decreases the distinction between telecommunications and information processing.
- Creates new pressures for competition in providing telecommunications goods and services such as the development of the interconnect industry and cellular phone services in parts of Canada.
- Broadens the gap between cost of service and rates. While long haul costs declined, long haul rates - used to subsidize local service - have not declined.
- Increases depreciation costs significantly due to the short time frame for obsolescence.
- Introduces the technical feasibility and cost-effectiveness for customers to "bypass" the established telecommunications industry to fulfill their telecommunications requirements.

3.3.2 Capital Investment of Telecommunications Carriers

The Canadian telecommunications carriers capital investment, in constant dollar terms, for both plant and machinery and equipment, experienced two distinct phases of development between 1971 and 1985 (Table 3.19).

TABLE 3.20

Capital Investment In Communication, By Province
Thousand of Constant 1981 Dollars*

	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA	B.C.	Yukon & N.W.T.	CANADA
1973	35.8	9.1	74.1	55.4	487.3	668.4	78.2	65.9	213.0	319.8	11.9	2,018.9
1974	49.8	12.0	96.7	64.3	561.4	847.8	89.3	85.0	309.1	331.7	6.9	2,454.0
1975	44.0	10.1	89.7	60.0	527.5	799.5	100.1	103.7	418.7	312.9	14.1	2,480.3
1976	41.9	9.4	81.3	73.4	594.7	778.9	98.7	115.4	374.8	400.7	13.0	2,582.2
1977	47.4	11.5	66.2	62.8	583.3	807.7	120.8	127.9	362.8	342.9	6.8	2,504.1
1978	35.2	10.6	65.1	52.3	636.6	799.2	87.0	115.3	370.1	302.2	14.7	2,488.3
1979	46.5	9.8	65.3	49.3	623.6	825.1	82.7	99.6	399.2	321.3	9.0	2,531.4
1980	50.4	10.2	74.4	51.1	707.5	950.0	95.9	142.0	501.5	366.7	17.4	2,967.1
1981	49.9	9.3	94.1	63.4	734.3	1,010.5	112.8	162.2	601.7	385.8	21.4	3,245.4
1982	47.5	6.5	78.6	59.3	689.9	971.9	116.1	143.1	476.7	438.2	23.8	3,051.6
1983	45.8	7.1	76.3	55.2	510.2	857.1	98.9	117.7	289.5	378.5	17.2	2,453.5
1984	48.2	7.7	98.6	62.1	563.3	931.5	116.8	92.5	273.8	368.8	18.8	2,582.1
1985 p	50.5	11.3	109.5	56.0	577.3	913.3	152.4	97.6	225.9	322.6	17.5	2,533.9
1986 i	51.3	13.2	121.0	66.6	626.5	991.4	133.8	128.3	273.1	340.4	19.1	2,764.7
Average Annual Rate of Change (Percent)												
1975-1980	2.8	0.2	-3.7	-3.2	6.0	3.5	-0.9	6.5	3.7	3.2	4.3	3.6
1980-1985	0.0	2.1	8.0	1.8	-4.0	-0.8	9.7	-7.2	-14.7	-2.5	0.1	-3.1
1975-1985	1.4	1.1	2.0	-0.7	0.9	1.3	4.3	-0.6	-6.0	0.3	2.2	0.2

* Current dollar component data deflated by the Implicit Price Indexes for Business Investment in Fixed Capital for Non-Residential Construction and Machinery and Equipment, with estimates for 1986.

p = based on preliminary actual data   i = based on the revised intentions.

Source: Statistics Canada, Private and Public Investment in Canada, Cat. No. 61-206 (revised intentions); and National Income and Expenditure Accounts, Cat. No. 13-201. Calculations by the Economics Practice, The Coopers & Lybrand Consulting Group.

- Between 1971 and 1980, total investment averaged annual increases of 6.4% due to changing technology as part of the modernization programs, expansion of service, and conversion of multi-party to single party lines.

- Between 1980 and 1985, total investment declined at an average annual rate of 3.8% in response to the recession of the early 1980's and an end to large scale modernization and service extension programs.

Nonetheless, total capital investment rose at an average annual rate of 2.6% between 1971 and 1985. The strong demand for improving network efficiency and capacity through digital switching technology and automation supported a healthy 4.5% annual rate of increase in machinery and equipment investment. Plant investment fell during the 1980s, registering a 0.4% average annual rate of decline over the 14 year period 1971 to 1985, since digital switching equipment and centralization of operator functions require substantially less space.

At the provincial level, capital investment data are available beginning in 1973 (Table 3.20). Over the period 1975 to 1980, the Prairie telcos (including the Territories but excluding Manitoba), showed substantial increases in capital investment at rates which generally exceeded or approximated the national average. The net inflow of population and the resource industry boom, led by the oil and gas industry in British Columbia, Alberta and Saskatchewan, boosted telecommunications demand rapidly. During the 1980 to 1985 period, the 1981-1982 recession took hold, and declining revenues in the energy and agricultural sectors slowed Western telco capital investment to rates below the national average. Manitoba was an exception, increasing its spending by almost 10% between 1980 and 1985.

In the Maritime Provinces, capital investment showed the opposite pattern - falling during 1975 to 1980, and increasing in the 1980s - reflecting the region's lagged response to economic events elsewhere in the country. In Newfoundland, capital investment increased during the mid-to-late 1970s, mainly because of expanding services to the provincial outposts in Labrador, but was static during the 1980s.

Central Canada, under Bell Canada's modernization Non-Urban Service Improvement (NUSI) Programs, showed fast growth in capital spending in the 1975 to 1980 period. Bell's cumulative increase in working capital between 1978 and 1980 during the NUSI program was $347.5 million (current dollars). The rate of growth in plant and machinery and equipment investment slowed in the 1980s as a result of high real interest rates and as the productivity improvement through automation began to reap benefits.

Although this analysis covers the general picture within the study period of 1971 to 1985, the year-to-year fluctuations in the spending pattern among provincial telcos can best be described as volatile. This is primarily due to the shifting priorities which provincial economic circumstances, as they affect aggregate service demand growth, may dictate. For example, relatively slower economic growth in one province may encourage the telco to reduce the spending component addressing growth in demand, and delay modernization plans until the limit of equipment obsolescence is approached. Secondly, the timing of major investments, such as the investment in a fibre-optics transmission network in Saskatchewan in 1979-1980, dramatically increased expenditures in one year, but does not show up in a linear time-trend analysis covering the entire 1971 to 1985 period.

3.4 A Strong Relationship Between Equipment Manufacturers and Carriers Has Fostered Growth of the Manufacturing Sector

The Canadian telecommunications manufacturing industry is closely tied to the domestic telecommunications carriers industry in two ways - direct ownership by a carrier firm (vertical integration) and through the Canadian purchasing preference of the carrier firms. The domestic industrial linkage has a positive impact in developing Canadian technology as well as providing a secured sales outlet.

This section of the report examines the impact of vertical integration in the Canadian telecommunications equipment supply market and identifies the equipment purchasing patterns of non-vertically integrated telecommunications carriers. Finally, the economic performance of telecommunications manufacturing at the national level from 1971 to 1985 is assessed.

3.4.1 Vertical Integration of Services and Manufacturing

There is a high degree of vertical integration within each of the two leading telephone companies - Bell Canada and B.C. Telephones (B.C. Tel) - which, together, accounted for 73.8% of the access lines in 1985. Northern Telecom Ltd. (NTL) and its research and development subsidiary Bell Northern Research (BNR) are subsidiaries of Bell Canada Enterprises, the holding company for Bell Canada. NTL and BNR represent Canada's largest telecommunications equipment manufacturer and private industrial R&D organization, respectively. The second vertically integrated equipment manufacturer, AEL Microtel, is a subsidiary of B.C. Tel. The research and development arm is Microtel Pacific Research Ltd. B.C. Tel is majority-owned (50.08% in December, 1986) by the American corporation GTE through its subsidiaries Anglo-Canada Telephone Co. and GTE International Inc. GTE also owns and controls Québec Téléphone.

Aside from the two vertically integrated telcos, NovAtel Communications - a joint venture between Alberta Government Telephones and Nova, an Alberta Corporation - is a manufacturer of cellular telephones. Finally, Mitel Corporation, a manufacturer of PBXs and circuits, was acquired by British Telecom in 1986 and is, therefore, the only domestic equipment manufacturer to be directly integrated with a foreign telecommunications service provider.

The practice of telco vertical integration with equipment suppliers came under the scrutiny of the Restrictive Trade Practice Commission in 1983. The key issue involved was to determine whether the regulated monopoly (telco) might pay its captive supplier excessive prices and include them in the rate base. The findings and conclusions of the Commission provide no evidence of unfair competition due to vertical integration of the telcos.

TABLE 3.21

Northern Telecom Manufacturing Facilities and Range of Products

Products	Canada	United States	Europe	Other
Business communications systems	Belleville, Ontario	Santa Clara, California		
Cable	Amherst, Nova Scotia Calgary, Alberta Kingston, Ontario Lachine, Quebec Regina, Saskatchewan			
Components, hybrid substrates and printed circuits	Belleville, Ontario	West Palm Beach, Florida		Kedah, Malaysia Penang, Malaysia
Information processing systems and data networks	Belleville, Ontario Scarborough, Ontario	Minnetonka, Minnesota Richardson, Texas	Hemel Hemptead, United Kingdom	
Outside plant	Saint-Laurent, Quebec	North Grove, Illinois		Rio de Janeiro, Brazil
Transmission	Aylmer, Quebec Saskatoon, Saskatchewan Saint-Laurent, Quebec Winnipeg, Manitoba	Atlanta, Georgia		
Repairs and Maintenance	Calgary, Alberta Montreal North, Quebec North York, Ontario Saint John, New Brunswick			
Semi-conductors	Ottawa, Ontario	San Diego, California		
Switching	Brampton, Ontario Calgary, Alberta Charlottetown, P.E.I. LaSalle, Quebec Montreal, Quebec St. John's, Newfoundland	Creedmoor, North Carolina Morrisville, North Carolina Raleigh, North Carolina	Turkey*	
Test Equipment		Concord, New Hampshire Moorstown, New Jersey		
Subscriber apparatus	Amherst, Nova Scotia Calgary, Alberta London, Ontario Regina, Saskatchewan Saint John, New Brunswick	Nashville, Tennessee	Galway, Ireland	

Source: Northern Telecom annual reports

* NETAS - A joint venture with the Turkish PTT

a. The Bell-Northern Telecom-Bell Northern Research Corporate Relationship

Following the 1983 reorganization of Bell Canada, Bell Canada Enterprises became the parent holding company of NTL, and owned 52.3% of NTL as of 1986. BNR, in turn, is a wholly-owned subsidiary of Bell Canada and NTL, with NTL owning 70% and Bell Canada 30% of BNR's shares.

NTL is engaged in the design, manufacture and sale of a reasonably full range of telecom products, including central office switching equipment, subscriber apparatus and business communications systems, transmission equipment, wire and cable, fibre optics, and related outside plant equipment (see Table 3.21). In the 1980's, NTL has broadened its scope of activities to include the design, manufacture and marketing of computer terminals and peripheral equipment.

Bell Canada purchases the majority of its hardware requirements from NTL, its preferred supplier. Under a supply agreement, and as required by the CRTC, NTL provides Bell with equipment at prices which are no higher than those to any other customer under similar conditions in the same timeframe. NTL benefits from the arrangement since it gathers technical specification information through its major client, Bell Canada, and thereby facilitates the design and delivery of equipment to meet Bell and other client needs.

BNR is the R&D centre of both Bell and NTL. Patents resulting from BNR's R&D activities are assigned to NTL under an agreement among Bell, NTL and BNR, to facilitate NTL's licencing activities. Royalties are divided between BNR and NTL. BNR does pursue work with other customers, but the work for NTL and Bell dominates its activities.

The rising importance of R&D at BNR dates back to a 1956 Consent Decree in the United States which altered a long-standing relationship between Bell Canada, NTL and AT&T and Western Electric, referred to as the Technical Information Agreement. Under this agreement Bell Canada was allowed access to U.S. Bell Laboratory telecommunications research, including management information on maintenance, operating and administrative practices, advice and training. The 1956 Decree raised the concern that proprietary information flowing to NTL may have to be extended to all U.S. manufacturers. Accordingly, beginning in 1959, the Technical Information Agreement became progressively restrictive and more expensive. By 1972, information flow ceased and, in 1975, the final AT&T-Bell Canada agreement ran out. As the flow of information under the agreement was reduced, Bell Canada turned to BNR as the prime source of research and development.

The major benefit of the Bell Canada/NTL/BNR, tri-corporate relationship is reported to be an ongoing exchange of information and revision of ideas which are vital for successful product development. To this end, the vertical integration serves to minimize the risk of R&D by relying on adaptive sequential decision-making, while at the same time avoiding extensive contingency claims contracts which would be required if reliance were made solely on the use of independent R&D firms.

NTL also derives many benefits from the tri-corporate interface, the primary one being that sales to Bell provide a secure source of income. Bell's R&D expenditures benefit NTL by expanding a common pool of knowledge. Bell's use of NTL equipment not only serves as a showcase, but reassures customers of quality and future adaption to carrier requirements. NTL's access to Bell's overall plans and detailed specifications provides an early and solid understanding of telco needs and product innovation has been fostered through this joint development process.

As evidence of the tangible benefits of Bell's vertical integration, the Restrictive Trade Practices Commission found that NTL gained through both product innovation and market penetration internationally. The point of contention was whether NTL could have achieved its considerable success internationally if it had not had an ownership link which implied access to market information through technical specifications for Bell's domestic market. The Bureau of Competition Policy argued that competing suppliers should have unrestricted access to the Bell market, and the Department of Communications (DOC) maintained that product/technological advancements and job creation in the telecoms industry were highly desirable. DOC further argued that all of NTL's European and Far Eastern competitors had some form of preferential access to their domestic telcos. Consequently, NTL could not have achieved its export potential if it had no guaranteed access to Bell's market. The Commission concluded that NTL's preferential access to Bell Canada had not imposed excess costs on domestic customers of their telecommunications services.

b. The B.C. Tel-AEL Microtel Relationship

B.C. Tel (whose voting control is held by GTE of the United States) is Canada's second largest telco. Until 1979, GTE,through its wholly-owned subsidiary, GTE International Inc., owned 100% of the manufacturing firms, GTE Automatic Electric (Canada) Ltd. and its wholly-owned subsidiary, GTE Lenkurt (Canada) Ltd. In 1979, B.C. Tel. instigated the purchase of both companies with the intent to rationalize operations and increase efficiency and competitiveness in the equipment market. A research subsidiary was established simultaneously and named Microtel Pacific Research Ltd.

Microtel's product line is comparatively more specialized and narrower than Northern Telecom's, with a primary focus on switching and transmission equipment. It also manufactures satellite transmission equipment and other apparatus such as alarm and power management systems and test equipment.

The purchasing relationship between B.C. Tel and AEL Microtel is less rigidly defined than in the Bell-NTL case where there is a formal agreement on purchasing. In 1975, the Department of Communications released the Pelletier report on the procurement practices of B.C. Tel and concluded that, between 1970 and 1974, the company purchased all hardware possible from its supply affiliates. Outside sources of supply were used only when the affiliates did not have a complementary product available. The same question regarding the openness of the B.C. Tel market arose again during the CRTC decision on the approval of the B.C. Tel purchase in 1979. Following its decision to monitor both the procurement policies and R&D expenditures of Microtel Pacific (CRTC Telecom Decision 79-17), the CRTC granted the purchase application in September, 1979.

The main arguments in favour of B.C. Tel's acquisitions are summarized as follows:

- Direct ties between the manufacturers and the operating company, along with the creation of the research subsidiary, would enhance the ability to perform R&D in Canada.
- Rationalization of operations (i.e., in component design, production and purchase) between GTE Automatic and Lenkurt would be facilitated, as both were increasing their use of the same technology.
- GTE Automatic and Lenkurt would, therefore, become more aggressive and visible in the market.
- B.C. Tel would have direct input into the design of its equipment.
- B.C. Tel would have a broader and more diversified source of revenue.
- Profits from B.C. Tel purchases would now flow to B.C. Tel, helping to hold rates down, rather than outside the regulated stream to foreign owners.

Prior to the takeover by B.C. Tel of the two Canadian manufacturing subsidiaries, product development information apparently received equal treatment from all customers, including B.C. Tel. There is scant information regarding the development process following the acquisition, other than the major product development is still centred in and directed from the United States. This led the Restrictive Trade Commission to a less positive conclusion on the benefits accruing from the B.C. Tel vertical integration as compared to the Bell-NTL case. Moreover, whereas NTL'S broad-line products can access the export market via direct competition, Microtel can enter the U.S. market only through its parent corporation, GTE. The Commission suggested that limitations were placed on Microtel as a leading-edge equipment supplier because of the small Canadian market and the absence of an unfettered entry route to the United States.

In summary, the tri-corporate relationship between Bell Canada, Northern Telecom and Bell Northern Research successfully created a dynamic structure, gaining the full benefits of economies of scale and scope. The company has placed Canadian telecommunications technology and products onto the international market. The company, however, has not shown itself as eagerly receptive to innovations developed domestically by non-affiliated companies. For B.C. Tel and AEL Microtel, the synergy effect through vertical integration is much less clear-cut, mostly because of a smaller product line, but also because of its inability to sell directly to the large American market without the involvement of the GTE Corporation in the process.

TABLE 3.22

Equipment Procurement Practices of Canadian Carriers

Company	Equipment Procurement Practices
Bell Canada	• Buys within territory where service provided to the greatest extent possible.
B.C. Tel	• Open tender; no preference to AEL Microtel but Canadian suppliers preferred.
CNCP Telecommunications	• Prefers Canadian where possible.
NorthwesTel	• Capital expansion equipment mostly Canadian, since they can service what they sell; no local suppliers. • Operating equipment, construction, etc., favour local suppliers.
Teleglobe Canada	• Lowest price for quality to meet specifications; public tender. • As a former Crown Corporation, tends to buy Canadian as much as possible (80%).
Terra Nova Tel	• Follows CNCP's practice of local, provincial, then national; no local suppliers, in general.
Alberta Government and Telephones (AGT)	• Prefers provincial if it meets price specifications; public tender.
Manitoba Telephone Systems (MTS)	• Open tender; provincial preferred if it meets price and specifications.
Maritime Telegraph & Telephone Ltd.	• Price first; no local suppliers to meet major equipment purchases (e.g., digital switches).
New Brunswick Telephone Co. Ltd.	• Prefers Canadian due to a lack of local suppliers.
Newfoundland Telephone Company Limited	• Buys Canadian if it can meet price and quality.
SaskTel	• Buy provincial policy.
'edmonton telephones'	• Quality first; prefers Alberta suppliers.
Northern Telephone Ltd.	• Prefers Canadian; no local suppliers; has service/maintenance agreement with Bell.
Québec Téléphone	• Prefers Canadian; public tender; no preferential supplier.
Télébec	• Service contract with Bell.

Source: Discussions with telcos carried out for this study by the Coopers & Lybrand Consulting Group.

The hypothesis that centralization leads to economies of scale and technological expansion, however, was questioned by the results of two other studies. A joint study on Total Factor Productivity (TFP) carried out between the Department of Communications and the Canadian Telecommunications Carriers Association showed that AGT, which is a non-integrated carrier, achieved a higher TFP growth rate than both Bell Canada and B.C. Tel, which are vertically integrated firms. Secondly, a statistical study by S. Globerman and J. Diodati (1980) revealed that the mere legal accordance given to vertical integration does not promote a supplier's R&D activity, other things being equal. However, a dominant purchasing position by a user does foster greater R&D intensity in a telecommunications equipment supplier, whether or not the supplier is linked through ownership by the user.

In the final analysis, the impact of vertical integration between service and manufacturing firms in the Canadian telecommunications industry, and particularly in the case of Bell and NTL, has demonstrated the global benefits for the Canadian economy. These benefits are dispersed regionally to a limited extent through the telcos purchasing preferences.

3.4.2 Equipment Procurement Practices of Canadian Service Carriers

As part of this study, carrier company specific information from the telcos on equipment purchases was gathered. In general, the results show that all telecommunications carriers in Canada tend to favour Canadian products. A summary of the procurement practices of the various telecommunications carriers is found in Table 3.22.

Both Bell[1] and B.C. Tel prefer to source equipment from companies within the carriers' territories; second preference is given to Canadian sources and as a last resort are products sourced internationally. These findings were confirmed from Bell reports which showed that 94% of its purchases were made in Quebec and Ontario, 4% elsewhere in Canada, and a scant 2% from outside Canada. Although no figures are available from B.C. Tel, the company indicated that it purchases through an estimates process and offers no preference to its manufacturing subsidiary, AEL Microtel.

From information obtained from AEL Microtel, it was estimated that about 40% of the company's manufactured equipment is sold to B.C. Tel annually. However, a large proportion (80%) of this equipment originated from the Microtel plant in Brockville, Ontario rather than from the Vancouver plant, mainly as a result of different product lines.

Neither Bell nor B.C. Tel performs contract R&D through purchase agreements, as R&D is performed through their respective subsidiaries - Bell Northern Research and Pacific Microtel Research. However, Bell is relatively active in extramural R&D activities, spending up to 2% of its annual R&D budget on academic or joint ventures with government researchers.

Apart from these two vertically integrated firms, the following information was obtained about telco procurement practices:

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[1] Bell's written policy (GC 303.21, Section 3, par 5.04) is contained in its "Procurement Policies and Procedures" manual.

- Telecommunications carriers in the Atlantic Provinces and the territories do not have an indigenous manufacturing base from which to purchase capital equipment such as digital switches, fibre-optic cables, etc. These products are purchased from manufacturers outside their region based on price and quality. However, local suppliers are favoured in construction work and small equipment purchases.

- Prairie telcos, including 'edmonton telephones', prefer to purchase equipment from manufactures with a local presence to foster local economic development, as long as it meets price and specification requirements.

- Independent carriers in Quebec and Ontario have all signed service and maintenance contracts with Bell Canada and also prefer Canadian made equipment.

- CNCP and Teleglobe also favour Canadian products.

These procurement practices of the telcos have changed little since they received extensive review by the Restrictive Trade Practices Commission on the telecommunications industry in 1982. Part III of the Commission's report, "The Impact of Vertical Integration on the Equipment Industry", indicated the following findings about purchasing practices:

- 80% to 85% of Bell Canada's equipment needs are met by NTL. Prices, according to the 1939 supply agreement must be "as low as to other most favoured customers for like materials and services under comparable conditions".

- NTL generally has first access to Bell specifications and can, therefore, develop and tailor products to meet these needs.

- Since several other Canadian telcos have service agreements with Bell Canada, NTL has access to telco plans and specifications. This also ensures product standardization, particularly from generation to generation, priority treatment and on-going support for equipment in place.

- After the CRTC approved B.C. Tel's acquisition of AEL Microtel in 1979, B.C. Tel issued competitive pricing procedures which consisted of an estimates or request for proposal process for complex equipment. Selection of supplier is based on a variety of technical and economic considerations including price, network compatibility and supplier support. B.C. Tel thus provides no advantage to AEL Microtel, but does give preference to Canadian manufactured products.

- Other telcos without affiliated suppliers, except CN and CP, give some preference to suppliers on the basis of their geographic location, after consideration of key criteria including price and product design. For provincial telcos, geographic preference is given to in-province suppliers first, and other Canadian suppliers second.

- Equipment manufacturers therefore believe that it is in their interest to spread their plants so that they are represented throughout their customers' territories.

Thus, equipment purchasing preferences tend to favour products manufactured in Canada, and to some extent regionally, when price and technical considerations can be met. This has resulted in telcos sourcing a large proportion of products from Canadian suppliers, and manufacturers, in turn, dispersing some of their production facilities throughout Canada.

3.4.3 Economic Performance of the Telecommunications Manufacturing Sector

Table 3.23 provides an overview of the industry indicators in the telecommunications manufacturing sector between 1971 and 1985. The telecommunications industry remains concentrated in the hands of a few large firms such as Northern Telecom, Microtel, Mitel, Spar Aerospace, Gandalf, which in 1982 accounted for 59.1% of the industry as shown in Figure 3.9. The manufacturers are becoming increasingly export-oriented as a direct result of the interconnect market in the United States which opened up in the mid-1970s, the court-directed divestiture of AT&T and de-regulation of U.S. long distance services, which all acted to expand export market opportunities for telecommunications equipment.

a. Gross Domestic Product

Figure 3.10 shows the relative growth rate in Gross Domestic Product between the telecommunications manufacturing industry and the total economy. Over the 1971 to 1985 period, telecom manufacturing achieved a 6.9% annual rate of increase, nearly double the 3.5% annual growth rate recorded by the general economy.

Because the manufacturing industry is closely linked to the telecommunications carriers, it has been more dependent on the telco performance than on the overall business cycle. The long-term investment programs of the carriers drive the performance of the manufacturers, and show little impact due to high interest rates. The one year of exception was during the 1982 recession when the sudden fall-off in equipment demand, both domestically and abroad, severely held back the growth momentum of the industry. During the 1981 to 1985 period, GDP growth for the telecommunications manufacturing industry moderated to a 5.1% annual rate, but still exceeded the 2.1% annual GDP growth rate of the general economy during the same period.

There are, however, significant year-to-year changes in the GDP growth of the telecom manufacturing industry, namely, an 18.5% jump in 1979 to 1980 and a 11.2% hike in 1983 to 1984. The sector responded to changing market and trade conditions, first through the expanding domestic market in 1980 and the penetration of the U.S. market in 1984 following AT&T's divestiture.

TABLE 3.23

Telecommunications Manufacturing: Performance Indicators

	1971	1975	1980	1981	1982	1983	1984	1985
GDP (constant 1981 $ millions)	814.0	1,196.0	1,558.5	1,693.7	1,730.5	1,687.3	1,876.0	2,067.0
Avg. annual rate of Change (%)	-	10.1	5.4	8.7	2.2	-2.5	11.2	10.2
Shipments (current $ millions)	660.2	1,368.1	2,328.9	2,786.5	3,055.3	3,125.4	3,820.6	N/A
(constant 1981 $ millions)[1]	1,571.9	2,257.6	2,581.9	2,786.5	2,803.0	2,741.6	3,226.9	N/A
Avg. annual rate of Change (%) in 1981 dollars	-	3.4	2.7	7.9	0.6	-2.2	17.7	
Employment	44,582	42,041	43,343	46,330	45,629	45,087	51,769	N/A
% Change	-	-1.5	0.6	6.9	-1.5	-1.2	14.8	N/A
Capital Investment								
• Plant (constant 1981 $ millions)	7.8	13.3	19.7	53.1	36.3	36.6	56.5	N/A
Avg. annual rate of Change (%)	-	14.3	8.2	169.5	-31.6	0.8	54.4	N/A
• Maintenance & Equipment (constant 1981 $ millions)	37.9	40.2	101.2	132.0	130.7	167.5	225.3	N/A
Avg. annual rate of Change (%)	-	1.5	20.3	30.4	-1.0	28.2	34.5	N/A
R&D Expenditures[1] (constant 1981 $ millions)	142.9	135.3	207.3	275.0	320.5	401.4	498.2	532.4
Avg. annual rate of Change (%)	-	-1.4	8.9	32.7	16.5	25.0	24.1	6.9
Productivity Shipments/Employee (current $ 1981)	35,259	53,700	59,569	60,144	61,430	60,807	62,333	N/A
Avg. annual rate of Change (%)	-	2.6	2.1	1.0	2.1	-1.0	2.5	

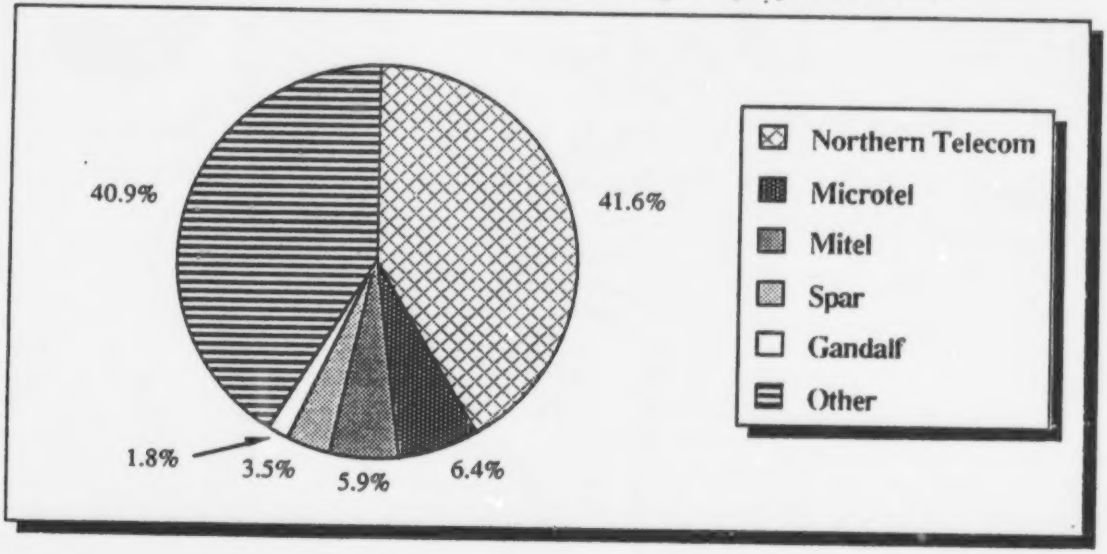
[1] Deflated to constant dollars 1981=100 base using Gross Domestic Product Implicit Price Index.

N/A Not available

Source: Statistics Canada, Communication Equipment Manufacturers, Cat. No. 43-206 (1971-1982); Communications and Other Electronics Equipment Industries, Cat. No. 43-206 (1983 to 1984): Industrial Research and Development Statistics, Cat. No. 88-202 (1984); and Gross Domestic Product by Industry, Cat. No. 15-512.

Figure 3.9

Telecommunications Manufacturing Employment 1982



Despite a strong 6.9% annual rate of GDP growth over the fourteen-year period studied, the telecom manufacturing industry's share of total GDP grew significantly, from 0.4% in 1971 to 0.6% in 1985. This is a reflection of the relatively faster growing service sector in the economy over that of manufacturing industries in general.

b. Shipments

In constant dollar terms, provincial data (available beginning in 1978) indicate that, between 1978 and 1982, the national output in telecommunications manufacturing, as measured by shipments, increased at an annual rate of almost 14% per annum. While shipments' growth was strong between 1980 and 1984, it is difficult to distinguish the impacts between the combined effects of market opportunities in the U.S. which stimulated exports, and the development of the interconnect market in Canada.

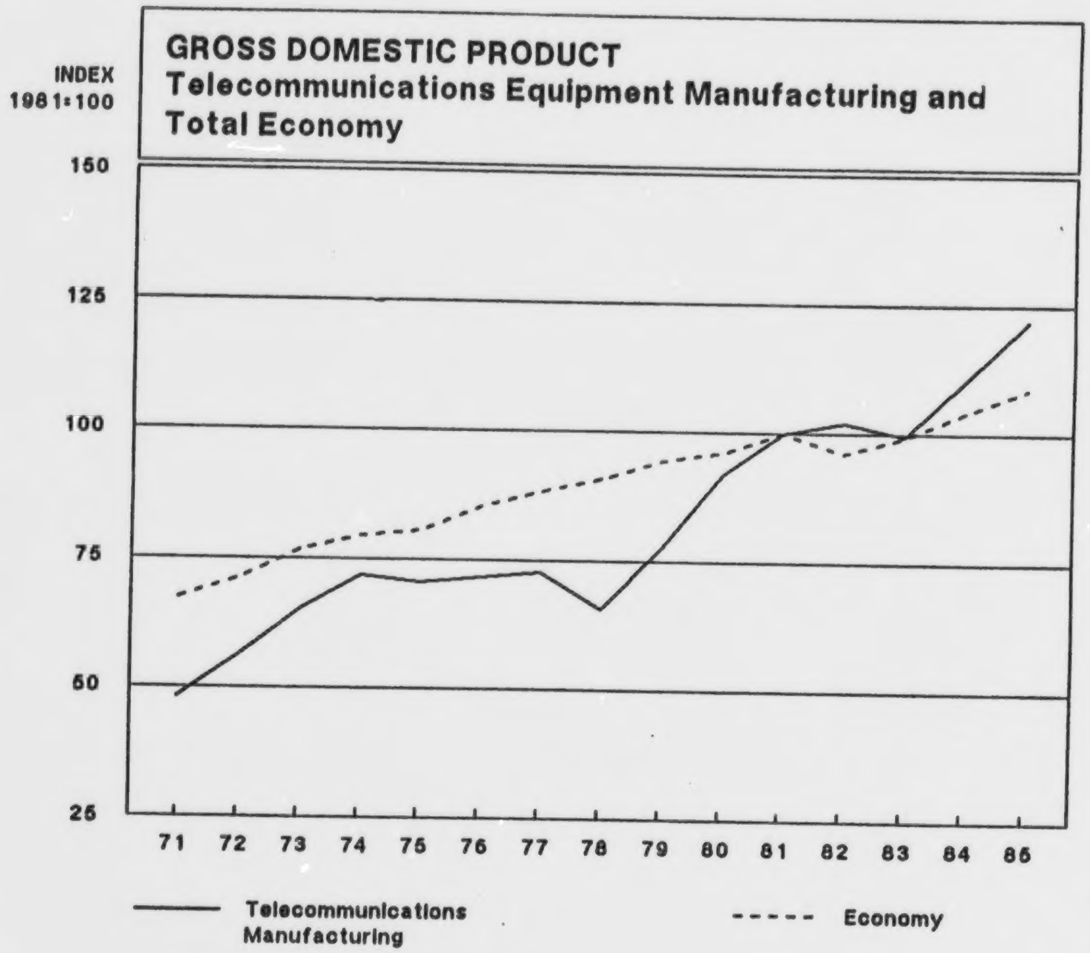
Quebec averaged growth of 17.1% annually, while in Ontario, shipments increased by 12.6% annually. The rate of increase in shipments by Manitoba and Alberta plants was most impressive: almost 500% for Manitoba (between 1978 and 1981) and 300% for Alberta. Both provinces' share of national output rose sharply: Manitoba from less than 1% in 1978 to 2.5% in 1981, and Alberta from 1.8% to 3% by 1982. The growing electronics industry in Manitoba and the establishment of Nortel plants and the start-up of Novatel in Alberta in the late 1970s were main causes for the expanded shipments.

British Columbia recorded growth in the telecom manufacturing shipments equal to the national average, but with a static share of 3% of the country's output between 1978 and 1982. Despite its purchase by B.C. Tel., Microtel began to focus its product line in niche markets, such as Very Small Aperture Terminal (VSAT) satellite dish. It relinquished the broad-line equipment market to Nortel mainly because of the high front-end research funding requirements and low margin in the telephone apparatus market.

c. Employment

During the 1970s, the industry moved from electromechanical to digital technology which required major changes in product lines and different labour skills to manufacture them. This new technology dramatically increased the capacity and flexibility of telecommunications carriers equipment and facilities, resulted in increased demand and brought about a significant increase in the employment in communications equipment manufacturing. While employment in the manufacturing industry fell almost 18% between 1971 and 1977, as new technology was introduced, and later as the IT&T divestiture in the United States expanded the market for equipment by reducing controls on regional telcos. Private terminal equipment purchases were permitted in some provinces in Canada after 1980, and this demand also stimulated the equipment industry to employ more skilled labour. By 1984, total employment had risen 41% over the 1977 level due to growing market opportunities.

FIGURE 3.10



Source: Statistics Canada, Gross Domestic Product by Industry (1961-1980), Cat. No. 15-512 Occasional; and Gross Domestic Product by Industry, Cat. No. 15-001 Monthly.

Figure 3.11 shows the ratio of telecommunications manufacturing employment to total Canadian employment as reported in the Ontario government's Study of Employment in the Communications Industry. The study explored the stimulus to employment growth and found that the best statistical correlation was obtained when revenues were used as an explanatory variable to observed changes in manufacturing employment. At the national level, a one percent increase in revenue resulted in a 0.94% increase in employment in tel-communications manufacturing. The explanation for the telecommunications manufacturing sector's employment trend is the introduction of new technologies for use by the telecommunications carriers industry.

At a regional level, only Ontario statistics were reported which cover the entire study period. Despite a 2.1% annual rate of increase, Ontario's share of total employment in the industry peaked in 1978 at 63.1% and had declined to 59.5% by 1984. There are insufficient employment data from the other provinces to determine whether the net loss in Ontario has been transferred east or west, however the data available for Manitoba and Alberta do suggest relatively strong employment growth in those two provinces from 1971 to 1981, but their combined share of employment nationally was still only 4% in 1981.

d. Capital Investment

Capital investment for the telecommunications manufacturing sector, as a whole, increased steadily from $45.7 million (constant $1981) in 1971 to $267.3 million by 1986. This represents an annual growth rate of 12.5%.

Constant dollar spending on construction grew at a pace of 14.4% annually, sightly higher than on machinery and equipment (13.3%). The most rapid period of investment increases was in the 1980 to 1985 period, as both construction and machinery and equipment investment rose at average annual rates of 21.2% and 16.5%, respectively. This investment trend reflects increasing equipment demand in anticipation of a domestic interconnect industry in 1980, as well as the AT&T break-up in the United States in 1984. It also reflects the advances in digital technologies, particularly in switches developed domestically by firms such as Nortel and Mitel. This has helped to sustain capital investment growth in the industry as Canadian products were well accepted internationally due to rising demand for state-of-the-art telecommunications equipment.

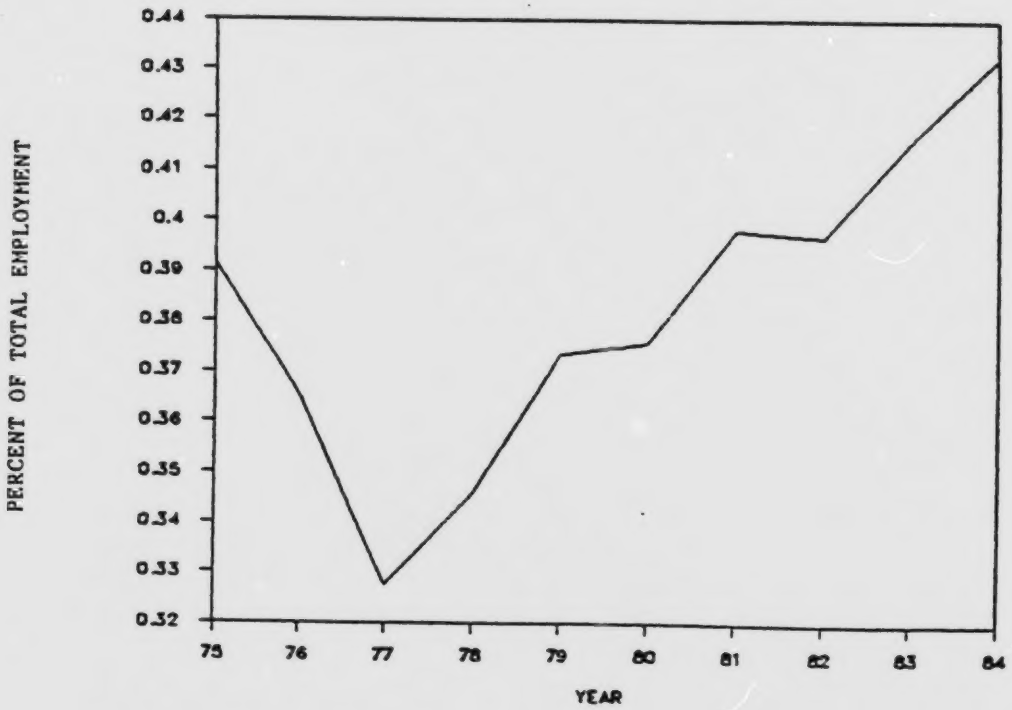
e. Productivity

Manufacturing productivity, as measured by the value of manufacturers' shipments per employee, in current dollars, increased at a 14.7% average annual rate nationally between 1971 and 1982. Of the six provinces for which manufacturers' shipments data are available, only Manitoba and Quebec (1971 to 1981) exceeded the national average at 26.2% and 19.3% per annum, respectively. Alberta was able to equal the national average, while Ontario, Nova Scotia and British Columbia were below.

In a shorter series, measured in constant dollars, the national trend shows a 9.6% average annual rate of increase between 1978 and 1982, but only 5.5%

FIGURE 3.11

Telcommunications Manufucturing's Share of Total Employment in Canada



Source: Ontario Ministry of Transportation and Communications, Study of Employment in Communications Industry (D.A. Ford and Associates), March, 1986.

between 1978 and 1984. At the provincial level, between 1978 and 1982, Alberta, British Columbia, Manitoba and Quebec exceeded the national increase in productivity. Manitoba and Alberta showed the best gains, averaging 27.7% and 21.7% annually. Productivity growth in Ontario was below the national average at a more modest 8.2%.

One of the reasons for the extraordinary gains in Alberta and Manitoba stems from the later period of development of telecoms equipment and electronic components manufacturing in this region in the mid-to-late 1970's. Investment at these early stages tends to result in significant increases in productivity. Thus, in relative terms, lower productivity growth occurred in those regions with a much longer history of industrial development.

3.5 Domestic and Foreign Regulatory Changes Have Provided Significant Growth Opportunities, Particularly Exports of Telecommunications Equipment

Although the domestic telecommunications manufacturing industry is not directly regulated by either the federal or provincial governments, it does receive tax and incentive support from governments (such as Scientific Research Tax Credits, Department of Regional and Industrial Expansion's and the Research Council's IRAP, IRDP and PEMD grants, etc.). Also, some of the industry's practices are scrutinized by the Restrictive Trade Practices Commission. In more general terms, government involvement is mainly at three levels:

- setting standards for technologies used;
- transferring technology to private industry, particularly in the area of satellite procurements and research; and,
- assisting in the international marketing efforts to ensure that Canadian manufacturers have a fair chance in international trade.

The telecommunications manufacturing industry is also affected by the changes in communications regulations and policies. In Canada, the liberalized terminal attachment market in Ontario, Quebec, British Columbia, Alberta, Nova Scotia, New Brunswick and Prince Edward Island has encouraged the establishment of a $300 million interconnect industry. The initiation of new services, such as the cellular telephone, also expanded the industry, as witnessed in the establishment of NovAtel in Alberta. Other telecommunications policies currently being studied, such as rate rebalancing, structural separation and regulatory rationalization, have the potential to affect the form of telecommunications services in Canada and, thus, the equipment needed to offer those services.

Because the telecommunications manufacturing industry is also export driven (see Section 3.5.2), communication policies of other countries also have direct impacts on the financial performance and growth potential for the industry. The liberalization of terminal attachment in the United States in the mid-1970's, which preceded the Canadian, also coincided with Northern Telecom's development of its DMS switches. With structural changes occurring in the United States telecommunications industry in 1984, Northern Telecom was well positioned to take advantage of opportunities for equipment sales in a market that had previously been served by a captive supplier relationship. The de-regulation of United States' long distance services has also opened market opportunities for Canadian suppliers as the new carriers equipped themselves to enter the market.

New opportunities now exist as a result of privatization of British Telecom and more liberal policies towards competition in some Western European countries, as well as Japan. The level of success for Canadian manufacturers in penetrating the markets internationally, however, is dependent upon the quality of Canadian products and the ability to meet the various standards.

Large Canadian equipment manufacturers are on equal footing with their United States' and European competition in the use of the latest, very large-scale integrated circuit techniques, and have a competitive edge in the areas of digital switching, packet switching, communication satellites and fibre-optic cables. However, technological advance has been expensive, particularly in terms of front-end R&D expenditures and sections 5.4 and 5.5 of this report detail the telecommunications industry's R&D expenditure pattern.

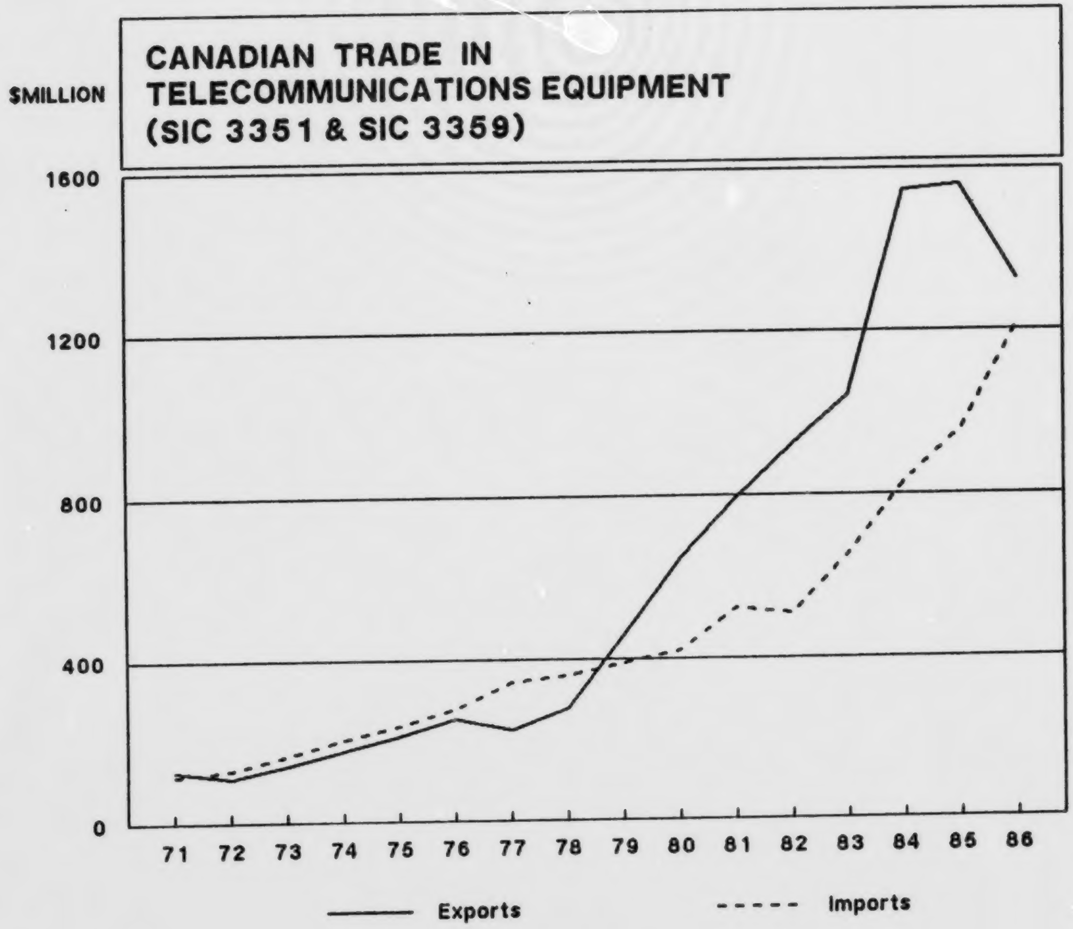
3.5.1 The Growth of the Canadian Interconnect Industry

The interconnect industry is a sub-component of the telecommunications industry consisting of vendors of terminal equipment and services. It developed following federal and provincial de-regulation of terminal attachments in Bell Canada and B.C. Tel territories in 1980 (Telecom Decision CRTC 80-14). The bulk of the industry is represented by over 100 small to medium-sized vendors. The majority of the firms are Canadian-owned and they offer products and services such as call forwarding, automatic dialing, PBX and Centrex systems, etc.

The industry has grown from a $116 million market in 1981 to $300 million in 1985, according to figures from Northern Business Information Inc. and the Angus Telemanagement Group. The revenues come from several components: PBX and key system equipment sales; moves, adds and changes; maintenance; and sales of miscellaneous equipment and services. The Canadian industry experienced rapid growth from mid-1980 to mid-1982, followed by several years of slower growth, and was able to avoid the worst effects of the 1982 recession because of its recent new entry to the market and new product lines. The Canadian industry's market share accounted for 22% and 34% of the total key systems and PBX systems, respectively, in Canada by the end of 1985.

A major challenge to the independent vendors is from the telco affiliates such as Bell Communications Systems Inc. and Telecommunications Terminal Systems. The telco affiliates have enjoyed great success through the availability of new products and first-hand awareness of the business community's requirements for advanced system features. Customers have been replacing old systems with new ones at an unprecedented rate. The affiliates have developed strategies to minimize market share losses to the independent vendors. These methods include:

FIGURE 3.12



CANADIAN TRADE IN TELECOMMUNICATIONS EQUIPMENT (SIC 3351 & SIC 3359)

Source: Canada, Department of Regional and Industrial Expansion, Electronics Industry Performance: Statistical Summary (Annual).

- lower prices to match those offered by independent interconnect companies;
- corporate-wide cost reduction through staff reduction and clearing of obsolete inventory; and
- broadening product mix to become more competitive.

The regional dimension for the Canadian interconnect industry shows that Ontario and Quebec accounted for 85% of the revenues in 1985. Ontario continues to be the fastest growing and largest interconnect market with 61% of the industry's revenues. This is due to the fact that certain forms of terminal attachment are not permitted in all regulatory jurisdictions across Canada, coupled with Central Canada's dominance in the industry and the high concentration of businesses, governments, universities, colleges and hospitals, which benefited from the much more rapid economic rebound from the 1981-1982 recession than in the Western provinces.

Alberta and British Columbia recorded losses in their market share as measured by revenue declines of 10% and 7%, respectively, in 1983, to 9% and 6% of the market in 1985. These market losses can be attributed to three reinforcing elements:

- lower than average interconnect prices;
- aggressive price competition at the outset which bid down prices to match competition; and,
- weak presence of large interconnect vendors in the Western Provinces due to a much lower revenue base.

Multi-line business systems were only opened to competition in Nova Scotia in May, 1985, and had a modest start, with less than $1 million in interconnect revenue in 1985.

3.5.2 International Trade in Canadian Telecommunications Equipment

Data for Canadian telecommunications equipment trade are available at the national level. Figure 3.12 shows Canada's trade balance in telecommunications equipment, i.e., SICs 3351 and 3359.

Between 1971 and 1986, Canada significantly improved its balance of trade in telecommunications equipment, starting in 1979. The growth in exports during the six years 1979 to 1985 was a rapid 22.8% annually compared to only a 16.3% annual rate for imports. This helped to create a $603.1 million surplus by 1985, compared to the trough in 1978 of an $84.2 million deficit. The trade balance diminished in 1986, mainly because a multi-million dollar satellite equipment sale to Brazil ended.

Export growth fell during the 1981-1982 recession when the worldwide economic downturn eroded demand. Imports, however, were affected more significantly

TABLE 3.24

Major Canadian Telecommunications Carriers and Their Regulatory Agencies

COMPANY	REGULATORY AGENCY
Newfoundland Telephone	Newfoundland Board of Commissioners of Public Utilities
Terra Nova Telecommunications	CRTC
Island Telephone	Public Utilities Commission of Prince Edward Island
Maritime Telegraph and Telephone	Nova Scotia Board of Commissioners of Public Utilities
New Brunswick Telephone	New Brunswick Board of Commissioners of Public Utilities
Bell Canada	CRTC
Québec-Téléphone	Régie des services publics du Québec
Télébec	Régie des services publics du Québec
Northern Telephone	Ontario Telephone Service Commission
Thunder Bay Telecommunications	Ontario Telephone Service Commission
Manitoba Telephone System	Manitoba Public Utilities Board
SaskTel	Saskatchewan Provincial Government Cabinet (beginning October, 1987)
Alberta Government Telephones	Alberta Public Utilities Board
edmonton telephones	City of Edmonton
British Columbia Telephone	CRTC
Prince Rupert	City of Prince Rupert and British Columbia Utilities Commission
B.C. Rail	Not regulated by any agency
NorthwesTel	CRTC
Telesat Canada	CRTC
CNCP Telecommunications	CRTC
Teleglobe Canada	CRTC (following privatization in 1987)

with a decrease in 1982 as manufacturers reduced their inventories in anticipation of falling world demand and to avoid the inventory carrying charges at high rates of interest. By the end of 1982, the industry was in a favourable position for a dramatic rise in world demand as the economic picture improved. With interest rates declining rapidly and favourable foreign currency rates, export sales jumped 12.8% in 1983, followed by another 48.3% jump in 1984. Although the Brazilian satellite sale helped to explain a major part of the extraordinary gains in 1984, the AT&T divestiture that year also boosted Canadian sales to the United States. In fact, the share of total Canadian communications equipment exports accounted for by the United States jumped from 55% in 1982 to 61.7% in 1984.

In terms of imports, the United States is Canada's main international supplier. The import share accounted for by the United States, however, fell from 80% in 1975 to 57.2% in 1986. The major penetration into Canada was achieved by Japan whose share of imports rose from less than 10% in 1975 to 25% in 1986.

Large companies such as Nortel (which produces large PBXs) and Mitel (a producer of small PBXs) directly benefited from recent industrial regulatory moves in the United States, including the liberalization of interconnect which began in the early 1970s, and especially from the AT&T divestiture. As a result, large companies were able to supply business customers with state-of-the-art technology replacement equipment in PBXs. Smaller firms also participated in the export boom because of their niche products. These firms have narrow product lines, and the export markets generate needed risk capital funds to sustain growth. Success in penetrating export markets can help small firms to break out of the niche environment and become a medium-sized player.

3.6 Carriers Will Continue to Face Increased Competitive Pressures

The Canadian telecommunications carriers industry is regulated by various federal, provincial and municipal regulatory agencies (Table 3.24). In spite of this mosaic regulatory structure, Canadian telecommunications carriers have operated with relative stability, providing communications services in a predominantly regulated monopoly environment. The main regulatory objective was to use price and rate-of-return regulation as instruments for achieving the dual goals of universal public telephone service and just and reasonable rates for subscribers.

This long tradition of stable regulation in Canadian telecommunications has met with strong crosscurrents stemming principally from change occurring in the large United States market during the late 1970s. Technological changes and innovations altered the cost of services and blurred segments of the industry's boundaries. Competition in providing communications services evolved through the combined effects of economic and political sources.

In the United States, both the Federal Communications Commission (FCC) and the courts had been moving towards deregulation and competition since the early 1960's. The free-market ideologies of the Reagan administration further entrenched deregulation in the economy in general and in telecommunications in particular. This included deregulation of terminal equipment and private line services, the Computer I & II decisions establishing distinctions between "basic" and "enhanced" services, competition in inter-state telecommunications services and, in 1982, the court-ordered divestiture of AT&T. The cumulative effect of these decisions has moved the United States telecommunications carriers industry from a regulated monopoly to a mixture of regulated and oligopolistic firms, with a strong market power still exercised by AT&T. Since the Canadian and United States telecommunications systems are similar in technological, industrial, institutional, policy and regulatory terms, changes in the United States structure have had their effect on Canadian policy as well. Canada is by no means unique in terms of introducing more competition into the telecommunications industry. Industrialized countries such as France, Japan and the United Kingdom are also reassessing the regulatory environment, favouring more openness and competition, particularly in the area of certain services and equipment.

Table 3.25 lists major decisions made by the CRTC which have reregulated many of the activities of six federally regulated telecommunications carriers, representing about 70% of the industry's assets, revenues and subscribers. Teleglobe Canada was added to the regulatory responsibilities of the CRTC when Bill C-38, "Teleglobe Canada Reorganization and Divestiture Act", received Royal Assent on April 1, 1987. The CRTC's regulatory objective regarding competition is stated in the Act as follows:

> "5. determine where regulation could be eliminated, reduced or made more flexible and, in particular, where regulation could be replaced/supplemented by reliance on market forces."

Even though federally regulated carriers may account for a majority share of the domestic market, they do not constitute a national market. CRTC decisions are often reflected or expanded upon by local regulatory bodies.

3.6.1 Changing Regulatory Climate at the CRTC

Beginning with the 1977 interconnection agreement between Telesat Canada and TCTS (now Telecom Canada), the federal regulator has introduced competition into the telephone carriage industry through system interconnection between Bell Canada and CNCP in 1979, terminal attachment in 1980, 1982 and 1984, the Bell re-organization in 1983 and enhanced services decision in 1984. This, however, has not taken the form of American-style free competition or deregulation. Although admitting that technological change has undermined traditional monopoly practices and made competition increasingly possible, the CRTC is also greatly concerned about the role of regulation within an increasingly competitive environment.

Telecommunications regulation has traditionally been a case of ensuring social objectives within a monopolistic environment. More recently, the CRTC

TABLE 3.25

Major Federal Telecommunication Regulatory Decisions

YEAR	REGULATORY DECISION
1976	• The Canadian Radio-Television and Telecommunications Commission (CRTC) Act transferred authority over telecommunications from the Canadian Transport Commission to the CRTC.
1977	• Telesat's application for membership to Telecom Canada (then the TransCanada Telephone System) was denied (Telecom Decision CRTC 77-10).
	• Telesat's entry to Telecom Canada approved by Order-in-Council.
1979	• CNCP Telecommunications allowed limited interconnection with the public switched networks under federal regulation (Telecom decision CRTC 79-11).
1980	• Interm decision allowing attachment of customer-owned terminals to Bell's facilities (Telecom Decision CRTC 80-14).
1981	• Extension of the Bell terminal attachment interim decision to B.C. Tel (Telecom Decision CRTC 81-19).
1982	• Final decision on terminal ownership allowed for all federally regulated carriers, except Telesat, including mainsets, wiring, 2-way mobile radio and telexes. (Telecom Decision CRTC 82-14).
	• 6% and 5% anti-inflation guideline imposed on federally regulated carriers, except Telesat and B.C. Tel, in August, 1982.

TABLE 3.25
(Continued)

Major Federal Telecommunications Regulatory Decisions

YEAR	REGULATORY DECISION
1982	• CNCP filed for an order by CRTC to be permitted to interconnect in AGT territory similar to the conditions of Telecom Decision 79-11; AGT did not file a reply, instead, CRTC's jurisdictional power was questioned; the case will be settled by the Supreme Court, possibly by 1989.
	• Revised definition of Telesat's customer base (Telecom Decision CRTC 82-7).
	• Began Phase III of the cost Inquiry (public notice of hearing December 15, 1981).
1983	• Bell re-organization approved through a report to Cabinet on April 18, 1983.
	• CNCP applied for interconnect to Bell and B.C. Tel networks to provide long distance services (October 25, 1983).
1984	• Concluded interconnection of 2-way mobile systems, including cellular radio, with public switched networks under federal regulations is in the public interest (Telecom Decision CRTC 84-10).
	• Unbundled rates for network access, terminal attachment and telex for business, residence and other services offered by CRTC-regulated carriers, except Telesat (Telecom Decisions 84-11, 84-12, 84-13, 84-14).
	• Enhanced services defined; in addition, enhanced service providers, other than CRTC-regulated carriers, will not be regulated and CRTC-regulated carriers are to permit resale of their services by enhanced service providers (Telecom Decision 84-18).

TABLE 3.25
(Continued)

Major Federal Telecommunications Regulatory Decisions

YEAR	REGULATION DECISION
1985.	• B.C. Tel denied approval to block access to certain discount long distance services in the United States; approved discount rate restructuring in its Canada-U.S. long distance rates (Telecom Decision 85-7).
	• Denied CNCP's 1983 application to offer competitive long distance services in Bell and B.C. Tel territory; CRTC questioned the ability for CNCP to provide universal access while offering price discounts contained in the proposed plan.
	• Approved B.C. Rail's application to interconnect with B.C. Tel in certain private line voice and data services; allowed resale and sharing of services other than long distance and local services.
	• Denied rate-rebalancing proposed by Bell and B.C. Tel; enforced a freeze on long distance rate increases pending an inquiry (Telecom Decision 85-19).
	• Decision on establishing cost manuals and accounting procedures on Cost Inquiry Phase III announced June 25, 1985.
1986	• Eliminated the need for Telesat to file tariffs for each station's services (Telecom Decision 86-21).
	• Aggregate burden test to be applied on Telesat (Telecom Decision 86-6).

has opened the market to competition, notably through its decisions on system interconnection (1979) and terminal attachment (1980 and 1982). By granting CNCP Telecommunications the right to inter-connect its microwave network to Bell's and later B.C. Tel's public switched network for providing private line services, the CRTC looked favourably upon the supportive submissions from user communities and the governments of Ontario and British Columbia. Cabinet denied the petition of the telephone companies which expressed concern about network integrity and the impact on their financial position. This was subsequently followed by the terminal attachment decisions wherein the CRTC ruled primarily in favour of the interests of institutional and business users, which were supported by the Director of Investigations and, once again, the Ontario and British Columbia governments. In 1984, the CRTC moved further by unbundling the rates of access lines from equipment rental. Bell Canada and B.C. Tel argued that these decisions would injure the equipment manufacturing industry, and public interest groups were concerned with their effects on local service rates. The CRTC however, rejected these views.

When the CRTC issued Telecom Decision 84-10 which allowed radio common carriers to interconnect their systems with those of the federally regulated carriers for local and long distance service, it set a precedent that was followed by CNCP's application for entry into the long distance telephone market in October, 1984. In 1985, however, the CRTC denied the CNCP application on the grounds that the CNCP was incapable of showing that it could effectively compete.

In its application to the CRTC, CNCP Telecommunications presented the Commission with a form of enforced or assured market sharing in which CNCP proposed to offer service at a 10% to 20% price differential. The CRTC, however, did not endorse this proposal.

A more explicit example of enforced market sharing is the policy followed by the Department of Communications in establishing a licensing arrangement for the cellular mobile radio services. By using its licensing authority, the Department was able to establish a duopoly type of situation in the marketing of cellular telephone services. Furthermore, by specifying the commencement date of the license, it influenced the timing of entry. In this example, Cantel, Inc., in effect, is provided with a preparation period of six months after regulatory approval by the appropriate commission, in order to establish its systems in a given market so that the two competing firms (Cantel and the local telco) might start offering their respective services to the public at approximately the same time. The measure serves to nullify a certain advantage of the telcos which, without the timing condition, would normally be able to offer the service at an earlier date. Rather than a complete elimination of barriers to entry, the federal government elected to introduce limited competition, and to maintain a role of control, not only to the extent of entry, but also the timing of the service introduction.

The CRTC's decision on enhanced services (Telecom Decision 84-18) offers still another perspective on how the federal regulator attempted to strike a balance between monopoly and competition through segmented regulation. The CRTC defined an enhanced service as one which includes computer processing or similar techniques in order to provide a customer with more than a basic communications path. As a part of the decision, the CRTC allowed unregulated companies to market enhanced services on an unregulated basis. On the other hand, federally-regulated telcos offering enhanced services remain regulated on their basic transmission services because of the telcos' ability to generate revenues from these in order to support their activities in enhanced services. The enhanced services decision was intended to open up the provision of enhanced services, while maintaining regulation of the underlying facilities and services.

The Bell Canada reorganization provides an example of how corporations can adapt to a changing environment. Previously, Bell Canada was a telephone company, with subsidiaries involved in a wide range of activities. In effect it was both an operating company and a holding company. As such, all of its activities, not just the provision of telephone service in Ontario and Quebec, were subject, or would be subject, to CRTC oversight. The reorganization created a true holding company, Bell Canada Enterprises, which holds 100 per cent of Bell Canada (the telephone company) as well as interests in a number of other companies such as Northern Telecom, TransCanada Pipelines, Maritime Telephone and Telegraph, etc. A number of BCE's subsidiaries are regulated by agencies such as the CRTC, while others such as Northern Telecom and BCE Commcor Inc. are not subject to regulatory oversight.

3.6.2 Regulation of Telecommunications at the Provincial Level

Aside from the variations in the pattern of ownership, major differences in the policy objectives of governments, regulators and the telcos exist for the non-federally regulated telcos. In most provinces the telco is an integral part of provincial economic policy, as reflected in the pursuit of universality through cross-subsidization and rate averaging, and also in the subsidization of some resource sectors and rural residential users. The basic nature of the relationships between provincial regulators and the telcos are also significantly different than those regulated federally. The CRTC generally maintains a more distant and critical relationship with its telcos. In the provinces, the relationships have, until the 1980s, been more intimate and non-confrontational. In recent years, however, this relationship appears to have changed.

The provinces have differed in their response to the pro-competitive stance of the CRTC. The following is a summary of major events:

- Prince Edward Island Public Utility Board accepted liberalized terminal attachment in 1979 as its earlier decision against such a move was overturned by the provincial Supreme Court. This preceded the CRTC interim decision to liberalize terminal attachment.

- Alberta, Quebec, Nova Scotia and New Brunswick have liberalized terminal attachment, with the two Maritime provinces being recent participants - 1985 for Nova Scotia and May, 1987 for New Brunswick.

- Manitoba, Saskatchewan and Newfoundland allow terminal attachment on residential extension sets only, but not for mainsets or business users.

- The share and resale of facilities services by business tenants are not allowed in Alberta, Saskatchewan, Manitoba and most of the Atlantic Provinces (except Terra Nova Telecommunications' territory which is under CRTC), although no applications have been made to change this.

In general, the CRTC and provincial regulators share a common concern over the detrimental effect that open competition may have on universal access, quality of service and bypass. Due to the geographical dispersion of the population which is predominantly rural and spread over large areas, the telcos rely upon their monopoly over toll charges to sustain their operations. It is argued that competition, and especially bypass, could seriously reduce toll revenue and, thus, the companies' ability to fulfill universal access and quality of service goals.

3.6.3 CRTC Regulation of Satellite Communications

The CRTC regulates both Telesat and Teleglobe, although full regulation of Teleglobe began in January, 1988. Both companies are key players in long distance telecommunications.

CRTC's regulatory control over Telesat began with the proposed Telesat/TCTS (former name for Telecom Canada) agreement in January, 1977. The agreement would have provided Telesat with the financial backing of a larger organization at a time when the initial five-year service contract with TCTS approached expiry and under-utilized capacity as well as negotiations for a second generation of satellites created huge financial requirements for Telesat. The CRTC turned down the Telesat/TCTS proposal because the guaranteed rate of return provisions would prejudice effective rate regulation and provide inequitable treatment of non-TCTS members (Telecom Decision 77-10).

TCTS appealed Telecom Decision 77-10 emphasizing the high Canadian content on the procurement of new satellites to be worth well over $25 million and the significant increases in service demand to be expected. The Cabinet however, granted the Telesat/TCTS Agreement on three grounds: the need for expanded service in the North to keep the cost of service down; the potential loss of contracts for the space industry; and the need to occupy quickly the orbital slots already being coordinated internationally.

In 1981, Telesat Canada was allowed to lease partial channels to interested buyers, but the federal government varied the decision to approved telecommunications carriers and broadcasters only (Telecom Decision 81-13 and Order-in-Council P.C. 1981-3456). Subsequently, Canadian Satellite Communications Inc. was granted a licence to deliver entertainment services to remote communities. Telesat requires the leasing of full channels, while CANCOM, on the other hand, provides users with reduced channel requirements the option to purchase partial channels from the corporation's leased full channels which CANCOM itself has leased from Telesat. Successive extensions to CANCOM's operating areas and services (such as data transmission for Canadian Press starting in 1986) have increased its requirement for Telesat channels from 4 to 8 and have expanded Telesat's revenue base as well. To further the cause, the CRTC approved reduced rates for satellite communications vis-à-vis microwave transmission (Telecom Decision 84-9).

Finally, when the Department of Communications announced on April 10, 1984, that it would liberalize earth stations' ownership for institutional and large business users after 1986, the CRTC concurred by eliminating the requirement for Telesat to file tariffs for earth station services and introduced the "aggregate burden test" in 1986 (Telecom Decisions 86-6 and 86-21). These policy and regulatory changes effectively enlarged the potential for wider usage of satellite communications services.

3.6.4 Regulation and Fundamental Issues: Cost Inquiries, Rate Rebalancing, International Bypass and Free Trade

Although "regulated competition" has received a disproportionate amount of attention due to its potential to alter the rules of the game, the CRTC and provincial regulators have also raised concerns over more fundamental issues such as costing, pricing and bypass.

Following the introduction of some competitive services, the regulator needs to, if at all possible, separate various costs appropriate to individual services in order to determine reasonable rates for both competitive and monopoly services and to prevent cross-subsidization from monopoly services to competitive markets. The CRTC pursued its Cost Inquiry which dated back to 1972 when the Canadian Transport Commission regulated telecommunications carriers in federally-regulated territories. Phase I dealt with accounting procedures, treatment of deferred taxes and problems surrounding depreciation practices. Phase II, which was completed in 1978, saw the CRTC accept an incremental costing method for new services which requires that, once such new services are profitable, they should contribute to reducing rates for local service. Phase III was undertaken between 1982 and 1985, and culminated with the development of a costing method which allocates costs between competitive and non-competitive services.

To supplement Telecom Decision 85-19 which stalled B.C. Tel's and Bell Canada's proposed rate-rebalancing schemes pending an inquiry, the joint federal/provincial examination of telecommunications pricing and the universal availability of affordable phone services was initiated. In October, 1986, the report noted that, whereas similar rating principles and practices have been adopted across Canada, rate levels for local and intra-company long distance telephone services vary considerably from company to company. However, rates for inter-company long distance services, with minor exceptions, are quite similar. A number of alternative rate structures for both local and long distance rates were tested. The report contended that, based on best available evidence, increased local rates would be unlikely to cause a large drop-off in telephone penetration levels, even for price increases of as much as 100 per cent.

It also concluded that telecommunications rate changes would have a minor impact on the overall cost structure and performance of Canadian business, both in domestic and international terms. Information-intensive Canadian businesses or those competing directly with United States counterparts, which have lower long distance rates, could be affected most by rate-restructuring.

Finally, although telecommunications services do not account for a large portion of a business' operating costs, the availability of high-quality, technologically advanced telecommunications products and services is essential.

The issue surrounding long distance rates has an international dimension as well. As a result of the telecommunications regulation in the United States, long distance rates in that country have been reduced significantly. The advancements in technology have created potential opportunities for Canadian businesses to avoid Canadian telecommunications carriers in favour of United States-based alternatives, i.e., international bypass. B.C. Tel was allowed to reduce long distance rates to compete with discount services from the United States (Telecom Decision 85-7).

The provinces and the Canadian government commissioned a study, The Impact of International Competition on the Canadian Telecommunications Industry and Its Users (1986). A that time, there were three cross-border resellers actively marketing services in Canada, two for southern British Columbia and one for Montreal. The level of bypass actually being carried out by Canadian businesses was found to be inconsequential, mostly because communications users perceived such activity as a contravention of current Canadian telecommunications regulations or policies. The impact of bypass on carrier revenues is estimated in the study to be $1.5 million in Canada-U.S. toll revenues and another $3.1 million in the loss of telex revenues, for a total of only $4.6 million or 1/25 of 1 per cent of carrier revenues.

To add to the increasingly complicated technological and competition-related issues which the telecommunications regulator has to face, new pressures are now found in the trade practices area. In October, 1985, the United States Congress passed legislation which recognizes the increasing economic importance of the service sector and begins to address service sector trade to the same extent as merchandise trade. This was lobbied for by the large telecommunications users in the United States. Moreover, the United States Trade and Tariff Act of 1984 allows the President to employ the principle of reciprocity to respond to any foreign policy, including telecommunications policy, which is proven to be unjustifiable, unreasonable or discriminatory, and which burdens or restricts United States' commerce.

In summary, technological changes have increased the role of competition in the telecommunications carriage industry. The Canadian regulatory scene has responded, in a limited way, to the international trend, which is led primarily by the de-regulation of the United States' telecommunications industry. However, Canadian regulators, be they federal, provincial or municipal, have shown a strong tendency to maintain a "regulated monopoly" structure within Canada. Different forms of regulation have been and will continue to be introduced as a substitute for an open and free marketplace. The tasks facing the regulators are also expanding in scope as issues in the telecommunications industry are no longer restricted to domestic origins (e.g., international bypass or free trade with the United States). Great as is the task at hand, even greater is the controversy over the merits of increased competition in Canadian telecommunications.

3.6.5 The Impact of Regulatory Changes on the Operating Environment of Canadian Telecommunications Carriers

Work Module No. 6 of this study includes a survey of Canadian telecommunications firms in order to measure the influence of economic as well as regulatory factors on their operating environment.

Within the federally-regulated companies, most companies reported an insignificant impact on revenue as a result of regulatory changes. The telcos have been able to offset the increased competition from independent interconnect companies distributing equipment and services following the final CRTC decision on terminal attachment in 1982. Factors such as a long tradition of service reliability and company size (which allows for more direct price competition through economies of scale) were key in retaining a dominant market share.

Despite the 6% and 5% anti-inflation guidelines for 1982 and 1983 and 4% rate increase in 1984, the issue of rates did not present an obstacle to revenue growth. B.C. Tel sought and received rate reductions in order to compete with U.S.-based long distance discount resellers.

CNCP Telecommunications was the carrier most affected by regulatory decisions. First, it has been unable to interconnect with the telcos in the Prairies and in the majority of the Atlantic Provinces pending a new national telecommunications policy on inter-provincial services or a decision handed down from the Supreme Court. Second, the current denial by the CRTC to permit competitive long distance voice service in federally-regulated territories has reduced CNCP's potential for new revenue sources. Finally, in the rate reductions in October, 1986, concerning Bell Canada's 1987 rates, the CRTC reduced intra-provincial long distance rates in Ontario and Quebec by 20%. CNCP reported that such rate reductions unfairly prejudiced their efforts to enter the long distance market by altering the initial economics of their 1983 application.

The remaining carriers all operate under different locally-regulated environments in terms of the degree of permitted competition. Alberta is probably the most liberal in its offering of terminal attachment, closely following the CRTC decision, while Nova Scotia and New Brunswick are more recent entries. All the independent telcos in Quebec and Ontario were forced to stay competitive with Bell, and terminal attachment was, therefore, allowed by the provincial regulators. These companies were able to retain a sizeable market share of the interconnect market. Québec Tel, however, is still frustrated in its attempt to gain full membership status in Telecom Canada and receive revenue distribution.

Most Prairie telcos are generally protected by the provinces' stance on maintaining their monopoly position since the telcos are an integral part of provincial economic policy. For example, only residential extension phones are allowed to be owned in Saskatchewan and Manitoba. But, like the Atlantic telcos, pressure for competition from external sources has created concern, to the extent that contingency plans are being prepared. Nonetheless, telcos regulated by provinces or municipal governments have not faced major regulatory impacts over the last five years.

While the telecommunications carriers, in general, did not find that the recent changes in regulation concerning the introduction of some competitive services have significantly affected their revenue performance, the impact is probably more significant in the employment area. As discussed, in Section 3.5.1, the CRTC's terminal attachment decision created a competitive interconnect market in some provinces of Canada and new firms were established. These firms subsequently created nearly 4,000 jobs nationally. Thus, the introduction of competitive sales of equipment and services have had a positive impact on employment. However, in the same survey of telecommunications carriers, productivity improvement programs via new technology has been in place since 1980. Competition, or the perceived threat of competition, can be considered to have encouraged the carriers to introduce major changes in technology, increase productivity and to become more capital intensive and less labour intensive.

3.6.6 Free Trade Will Benefit Users, But Provide Increased Competition to Canadian Firms Providing Enhanced Services and Equipment

Since 1978, Canada has had a net surplus in the trade of telecommunications equipment. Over the period 1979 to 1985, exports grew at a 23% annual rate, while imports rose by 16% annually. By 1985, Canada's trade surplus in telecommunication equipment reached $603 million.

The United States is Canada's major export market as well as a key source of imports. Canadian companies have been able to benefit from U.S. industrial regulatory moves which liberalized interconnection beginning in the early 1970s and especially from the AT&T divestiture in 1984. Canadian telecommunications equipment manufacturing firms were able to establish themselves in particular niches such as large PBX switches (Nortel) and small PBX switches (Mitel), with state-of-the-art technology. Many smaller Canadian firms also participated in the export boom to the United States (as shown in the case studies) because of their product specialization.

Liberalization of trade with the United States under the Free Trade Agreement will reduce and ultimately eliminate tariffs and other barriers in the form of custom regulations, preferential buying practices and investment. For Canada's equipment manufacturers, this will effectively lower the price of Canadian products, but only marginally, given the relatively low tariff rates currently in place. Export sales will thus be determined by equipment demand of U.S. telcos and businesses as Canadian manufacturers prove their capability of competing in the U.S. market.

Of greater concern is the increased competition in the domestic market created by the Free Trade Agreement. This will affect both manufacturers and the industry which provides telecommunications product services.

With open tendering process and elimination of preferential buying practices, domestic suppliers will face competition from U.S. equipment manufacturers. Nortel and AEL Microtel can be expected to be particularly affected due to their relatively large share of the Canadian market.

Product servicing, particularly in the interconnect market, is a major growth area. The biggest markets for these services are manufacturing businesses and government. Since a relatively low proportion of these services are now imported, new American initiatives will create price competition and a broadened range of new products. These developments will be important for manufacturing industries where there is already a well established trend to "contracting out". Firms have moved to purchase inputs from outside firms, rather than providing them "in-house". This is especially true in the service sector. This trend may reflect the fact that productivity growth related to producer specialization has reduced costs in the service sector faster than in secondary manufacturing, which will be attempting to catch up in order to meet the competition from U.S manufacturers.

Indeed, in some sense, it is becoming difficult to distinguish the manufactured goods from the "services" that are either embedded in the product or sold as a support/maintenance package, particularly in telecommunications. In this world of growing complementarity between goods and services, access to low cost, state-of-the-art services, is a key to success in manufacturing.

American firms providing these telecommunications services can be expected to have cost advantages arising from established economies of scale, and to some extent from strong productivity growth in recent years. Canadian providers have an exchange rate advantage, but this may be only temporary, and may be offset by higher unit costs.

Canadian firms will, however, be provided the opportunity to realize scale economies by pursuing U.S. market opportunities. The route to long-term competitive advantage in world markets is through specialization in particular product lines, longer production runs and volume discounts from suppliers. There is new evidence that these economies of scale also extend to various services where new information technology creates scale-related cost reductions.

Exploitation of this option will require that most firms contemplate substantial and risky changes. They must narrow their product offerings, invest in new facilities, develop new customers in areas where they have not sold before. The objective of being the world-class producer of one particular product, as tends to be the case of Canadian telecommunications producers, is a major risk if the chosen product does not have a large enough market. Canadian firms may, therefore, have to pursue a strategy of product diversification in the short term. In this way, they will be competitive in both the U.S. and Canadian markets.

4.0 TELECOMMUNICATIONS' IMPORTANCE TO CANADIAN BUSINESS

This chapter focuses on the role of telecommunications in providing infrastructure support to businesses in all regions of Canada. The discussion highlights the critical importance of both voice and data communications services to large and small businesses, and shows how their needs vary. Differences in service levels and availability between major urban centres and outlying regions are reported along with the recognition by the telcos of the need to increase investment in areas outside the major centres. As revealed by the research, telecommunications costs are generally a relatively small share of total business operating expenses, but are collectively large in absolute dollar terms and are regarded as necessary but controllable costs. Nevertheless, telecommunications are important to business profitability.

The analysis provided here is based on research undertaken in modules 3 and 4 of the study. For Work Module 3, a survey of nearly 600 smaller Canadian businesses, defined as those companies with up to 500 employees, was undertaken. A copy of the questionnaire is contained in Appendix II.

The sample contains a high representation of smaller businesses, with fully half of those surveyed having 11 or fewer full-time employees in their businesses. The results presented in the tables accompanying this chapter are for the sample as a whole. While regional results are discussed, the tables containing these figures are presented in Appendices III, IV and V which show provincial, sectoral and size disaggregations respectively. Work Module 4 provided information on larger businesses through a series of 11 regional workshops on their use of and needs for telecommunications services.

The survey results using the broader aggregates (i.e. total provinces or industries at the national level) were treated with a greater degree of statistical confidence, roughly at a 5% level, or accurate 19 times out of 20. However, two cautions should be expressed about the results. First, the regional, sectoral or size breakouts represent small samples and their reliability is limited. Second, and in combination with the first point, the predominance of smaller firms in the survey, many of which are not conversant with telecommunications technologies and have only basic needs for these services, suggests that not all the questions were well understood. The results should therefore be interpreted with these factors in mind.

4.1 Telecommunications are the Lifeblood to Canadian Business, But Requirements Vary Across Business Size and Sector

Both large and small Canadian businesses in all parts of Canada consider telephone service essential to their business operations. According to the survey, the majority of respondents (75%) indicated that long distance telephone services were very important to their organizations (Table 4.1). Only 9% of respondents indicated that long distance telephone services were unimportant to the success of their business.

TABLE 4.1

Importance Of Long Distance Telephone Services To Success Of Organizations (Q.4)

	Total Sample
Sample Size	592
Very important	75%
Somewhat important	16%
Not very important	7%
Not at all important	2%

TABLE 4.2

Distribution Of Long Distance Calls By Destination Of Call (Q.5)

	Total Sample
Sample Size	582
Within area code	64%
Elsewhere in province/territory	
Elsewhere in Canada	29%
In the U.S.A.	5%
Overseas	2%

Regionally, the proportion of respondents who indicated that long distance telephone services were very important ranged from 52% in British Columbia to 90% in the Northwest Territories. Across industrial sectors, the proportion of respondents who indicated that long distance telephone services were very important ranged from 63% for the construction sector to 86% in retailing. Across organization sizes, substantially more large organizations (87%) indicated that long distance telecommunications are very important than very small organizations (68%).

Workshop participants also indicated that long distance services continued to be essential to the operation of large firms in all industrial sectors. A heavy reliance on long distance services was particularly evident for financial institutions and data processing. These firms' day-to-day operations depend on long distance telecommunications.

While long distance service is essential to organizations in all sectors, the pattern of long distance calls varies. In the survey, Canadian business respondents estimated that the majority (64%) of their long distance calls (including both voice and data) were intra-provincial/territorial (Table 4.2). In addition, respondents indicated that a considerable number of long distance calls (29%) were made to other provinces/territories. Very few calls were made to the United States (5%) or overseas (2%), with little provincial or industry variation, with the exception of British Columbia businesses which made 14% of their long distance calls to the United States.

Across the provinces/territories, the proportion of long distance calls made to destinations within the provinces/territories ranged from 37% in the Yukon to 84% in Quebec. The proportion of calls made to other parts of Canada ranged from 6% in Quebec to 59% in the Yukon. The proportion of long distance calls made to the United States ranged from 2% in Nova Scotia, Alberta and the Northwest Territories to 14% in British Columbia.

Across industrial sectors, the proportion of long distance calls made within the same province/territory ranged from 49% for the mining sector to 77% for the government/non-profit sector. Conversely, the proportion of long distance calls made to other provinces/territories ranged from 21% in the government/non-profit sector to 40% in the mining sector. The proportion of long distance calls made to the United States ranged from 1% for the government/non-profit sector and 2% for the construction and retail sectors, to 7% for the mining, transportation/communication/utiliites and service sectors. Overseas calls ranged from 0% in the construction and retail sectors to 4% in the mining sector. Little variation in long distance call destinations was found across the various sizes of organizations.

Larger businesses who participated in the workshop sessions often represented companies which had a higher proportion of long distance calls on a national basis in several provinces and countries than respondents to the surveys. Moreover, they indicated several specific factors which influenced the pattern of long distance usage and call destinations, namely:

- branch versus head office location,
- nature of the business,
- location of major markets, and
- location of major suppliers.

While these factors may be self-evident, the requirements for businesses to have telecommunications links to their customers, supplier base and head or branch offices underscores again the importance of long distance service links to Canadian businesses.

4.2 There is a Broad Range of Services Available to Canadian Business, But the Type and Quality Vary Between Major Urban Centres and Other Areas

Basic telephone service is widely available in Canada. As the result of technological advancements, special or enhanced services have been developed. The research examined eleven types of enhanced or special telecommunications services which can contribute to many businesses. These include:

- data communications,
- cellular telephones,
- mobile 2-way radios,
- paging units,
- TWX/TELEX machines,
- facsimile machines,
- teleconferencing,
- public electronic mail,
- database services,
- wide area telephone service (WATS), and
- Zenith and 800 services.

The availability and use of these services vary across the country and by business size and sector. Variations in the level of understanding of what these services are seem to be reflected in the results which should, therefore, be interpreted with caution. Specifically, analysis of cellular phones has been excluded due to the unreliability of the responses. Nonetheless, it is interesting that many small businesses are unfamiliar with many of these services and their application.

4.2.1 Data Communications

Data communications is a telecommunications service used almost exclusively by the business sector. Computer usage is a pre-requisite for data communications, which was relatively low among the respondents to the survey. About half (53%) of the organizations surveyed reported that they used computers, (Table 4.3). The level of penetration of computers was particularly low among smaller businesses. By contrast, almost all large businesses participating in the workshops used computers extensively in their operations. While there was little regional variation in computer usage which ranged from 41% in Nova Scotia to 62% in Ontario and Alberta, there was substantial industrial sector variation which ranged from 32% in agriculture/forestry/fishing to 71% in the finance/insurance/real estate

TABLE 4.3

Use Of Computers In Offices (Q.6)

	Total Sample
Sample Size	592
Yes, computers used	53%
No, computers not used	47%

TABLE 4.4

Types Of Computers Used (Q.7)[1]

	Total Sample
Sample Size	313
Personal computers	74%
Minicomputers	36%
Mainframes	33%

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[1] Asked only of those respondents whose organizations use computers

sector, 64% in the government/non-profit sector and 61% in manufacturing. There was also substantial variation across organization size, with computer usage varying from 24% for very small organizations to 87% for large organizations. Of those organizations using computers, the most popular computers were the personal computers (74%) followed by minicomputers (36%) and mainframes (33%) (Table 4.4).

There was little variation in these results across provinces/territories. Across industrial sectors, there was little variation in personal computer usage, but minicomputer usage varied considerably from 12% in mining to 55% in finance/insurance/real estate. Mainframe usage ranged from 9% in construction to 70% in the wholesale sector. There was little variation in these results across organization sizes except for mainframe usage which ranged from 8% for very small firms to 54% for large firms.

Among organizations using computers, the most frequent application area was accounting (88%), followed by administration (81%), production/operations (57%), inventory management (52%), sales (47%) and research (23%) (Table 4.5). There was little variation in application areas across the provinces/territories. There was also little application variation across the industrial sectors. Considerable application variation was found across organization size.

Most respondents using computers indicated that computers were very important in the areas of accounting (87%), inventory management (78%), administration (77%), production/operations (73%), sales (70%) and research (55%) (Table 4.6). The same pattern of findings held across provinces and across industrial sectors.

Among those organizations which use computers, 30% used data communications (Table 4.7). Since only 53% of all organizations use computers, it was estimated that only 16% of all organizations use data communications. Across the provinces/territories, use of data communications ranged from 9% in Newfoundland to 52% in Manitoba. Across industrial sectors, the use of data communications ranged from 14% in finance/insurance/real estate to 52% in retailing. Across organization sizes, the use of data communications ranged from 8% in very small organizations to 48% in large organizations.

The most common application for data communications was administration (65%) followed by accounting (60%), inventory management (50%), sales (48%), production/operations (46%) and research (23%) (Table 4.8) Provincial/territorial and industrial sector figures for data communications' usage were not available due to the small sample size.

Businesses were also surveyed about the importance of data communications to specific applications (Table 4.9). Among firms using data communications, the majority of respondents (74%) indicated that data communications were very important to their organization, specifically for computer applications including accounting (80%), production/operations (79%), inventory management (78%), administration (76%), sales (71%) and research (71%) (Table 4.10).

TABLE 4.5

Areas of Computerization in Organizations (Q.8)

	Total Sample
Sample Size	309
Accounting	88%
Administration	81%
Production/Operations	57%
Inventory Management	52%
Sales	47%
Research	23%

TABLE 4.6

Importance of Computerization by Application (Q.9)

	Administration	Accounting	Production/ Operations	Sales	Research	Inventory Management
Sample Size	249	272	176	146	71	162
Very Important	77%	87%	73%	70%	55%	78%
Somewhat Important	17%	10%	22%	25%	42%	17%
Not Very Important	6%	3%	5%	5%	3%	5%
Not At All Important	0%	0%	0%	0%	0%	0%

TABLE 4.7

Use Of Data Communications (Q.10)[1]

	Total Sample
Sample Size	311
Yes, use data communications	30%
No, do not use data communications	70%

[1] Asked only of those organizations which use computers.

TABLE 4.8

Reasons For Use Of Data Communications (Q.11)

	Total Sample
Sample Size	92
Administration	65%
Accounting	60%
Inventory Management	50%
Sales	48%
Production/Operations	46%
Research	23%

TABLE 4.9

Overall Importance Of Data Communications (Q.13)

	Total Sample
Sample Size	91
Very Important	74%
Somewhat Important	23%
Not Very Important	3%
Not at all Important	0%

TABLE 4.10

Importance Of Data Communications By Application (Q.12)

	Administration	Accounting	Production/ Operations	Sales	Research	Inventory Management
Sample Size	59	55	42	44	21	46
Very Important	76%	80%	79%	71%	71%	78%
Somewhat Important	22%	13%	19%	20%	24%	22%
Not Very Important	2%	7%	2%	9%	5%	0%
Not At All Important	0%	0%	0%	0%	0%	0%

The most important features of data communications were its timeliness (90%), economy/cost (75%) (Table 4.11) and access to databases (72%).

The majority of data communications long distance calls are made to destinations within the same province/territory (58%), followed by destinations elsewhere in Canada (36%), in the United States (4%) and overseas (1%) (Table 4.12). The most common data communication method is a standard voice line (55%), followed by a dedicated/private line or network (45%), a public carrier data network (such as Datapac) (37%) and a conditioned voice line (23%) (Table 4.13). Almost half of those using data communications services (Table 4.13) also had in-house data networks within the same building (Table 4.13).

The main factors preventing the increased use of data communications were costs/budget restrictions on computer equipment (37%), the cost of service (27%), the lack of service availability (22%), lack of technical expertise (22%), incompatibility of systems (21%), and lack of knowledge of data communications (14%) (Table 4.14).

Among those respondents whose organizations do not currently use data communications, only 21% indicated that they were likely to use data communications within the next three years (Table 4.15).

Main factors which prevented organizations from employing data communications were lack of expertise (29%), system incompatibility (26%), cost of service (26%), and service unavailability (26%). Many organizations (44%) do not anticipate the need for using data communications over the next three years (Table 4.16).

The workshop discussions focused on strategic issues associated with the provision of data communication services, namely:

- The growth of data communications and its role in business.
- The availability of telecommunications in major centres, as well as outlying areas and remote Northern locations.
- The cost structure of data communications which favours large users.
- Non-cost barriers to data communications usage by smaller users.

Larger organizations start to use data communications before smaller businesses do. Large organization usage of and needs for data communications services therefore lead the needs of the business community. These issues, while articulated by large organizations and may, therefore, be more current to their needs, are also important to smaller businesses, and the interaction between larger and smaller Canadian businesses.

Workshop participants indicated they expected in the near term that the rapid growth of data communications would exceed that of voice communications. This growth is driven by an increased demand by all firms for these services

TABLE 4.11

Important Features Of Data Communications (Q.14)

	Total Sample
Sample Size	89
Timeliness	90%
Economy/Cost	75%
Access to data bases	72%

TABLE 4.12

Distribution Of Data Communications By Destination (Q.15)

	Total Sample
Sample Size	89
Within area code	58%
Elsewhere in province/territory	
Elsewhere in Canada	36%
In the U.S.A.	4%
Overseas	1%

TABLE 4.13

Data Communications Systems Characteristics (Q.16, 17)[1]

	Total Sample
Sample Size	84
Uses standard voice line	55%
Uses in-house data networks	47%
Uses private line or network	45%
Uses public carrier data network (e.g., datapac)	37%
Uses conditioned voice line	23%

[1] Asked of those respondents whose organizations use computers.

TABLE 4.14

Factors Preventing Organizations From Using Data Communications More (Q.19)

	Total Sample
Sample Size	90
Cost of service	27%
Incompatibility of systems	21%
Lack of service availability	22%
Lack of technical expertise	22%
Related costs/budget restrictions	37%
Other reasons	17%
Lack of knowledge of data communications	14%
Just a matter of time	14%
Current use is adequate	11%
Security concerns	6%

TABLE 4.15

Likelihood Of Starting To Use Data Communications In Next Three Years (Q.20)[1]

	Total Sample
Sample Size	215
Very likely	21%
Somewhat likely	29%
Not very likely	28%
Not at all likely	22%

[1] Asked of those respondents whose organizations use computers but not data communications.

TABLE 4.16

Factors Preventing Organizations From Starting To Use Data Communications (Q.21,22)

	Total Sample
Sample Size	212
Not needed	44%
Lack of expertise	29%
Incompability of systems	26%
Cost of service[1]	26%
Availability of service	26%
Related cost/budget restrictions	11%
Other reasons	11%
Organization is too small	9%

[1] The "cost" of service as an input to business was the question asked. This can be viewed as the price of service offered.

due to increasing penetration of computers and data communications services. Participants also suggested that this growth may level off as firms decentralize computer operations in response to data communications costs. Decentralization, however, may be practical for large businesses operating in several locations, but is less viable for firms operating in a single location with links to an extensive customer or supplier base.

A critical concern for larger businesses is the continuing lack of data communications service in areas outside major urban centres. For example, data communications services, such as Datapac and conditioned lines are often not available in these areas making it difficult for some firms to serve their customers. As well, some financial institutions cannot install automatic teller machines (ATM) in certain rural areas due to the lack of data communications.

Participants also reported wide variations in the availability and quality of data communications across regions which affect their businesses. Some regions offer data communications services in rural areas, while others do not. Some offer good networks of data quality lines, but lack digital switches while, in other regions, the reverse is true. Another problem is maintenance and repair service. In the North, it is not uncommon to have lines out of service for extended periods of time. Overall, across the country, there is a general need for faster and higher quality data networks.

In part, the concerns expressed by large organizations are a reflection of their operations. The lack of services or poor quality of services requires the use of two information systems - one electronic and one paper - to ensure that businesses can function effectively. This results in additional costs and inefficiency required to maintain duplicate systems.

Concern was also expressed about price barriers which limit the access of smaller businesses to data communications. The economic structure of data communications clearly favours the large user and those in major urban centres as competitors providing these services seek high volume businesses and routes, and lower their prices to attract customers. Datapac is very cost-effective for the large user, but it is too expensive for the small business user. The economic structure of data communications also tends to be costly on a intra-provincial basis.

In addition to cost variables, small users face non-economic barriers to the use of data communications. Many small users lack the expertise, as data processing expertise is not always readily transferred to data communications.

4.2.2 Data Base Services

Data base services such as iNet are widely available in major centres across the country, but this is not the case for rural and remote areas. Business use is hampered by several factors as indicated primarily by large businesses through the workshops, including:

- the lack of "user friendliness",
- the lack of data bases,
- difficulty in accessing American data bases,
- the need for special terminal equipment,
- the high cost of using data bases, although iNet itself is inexpensive, and
- the lack of availability of advanced features.

Eight per cent of organizations reported using data bases (Table 4.17). Across regions, data base service usage ranged from 0% in Newfoundland and 2% in the Yukon to 17% in Saskatchewan. Across industrial sectors, data base usage ranged from 0% in transportation/communications/utilities to 15% in services and finance/insurance/real estate. Across organization sizes, data base usage ranged from 2% of very small organizations to 15% of both medium and large organizations.

Among these respondents, 15% indicated planned increases in their use of data base services (Table 4.18). Regionally, this ranged from 9% in Nova Scotia, Prince Edward Island and British Columbia to 26% in Saskatchewan and the Northwest Territories, and from 4% in construction to 24% in the service sector. Across organizations sizes, planned increases of data base services ranged from 8% of very small organizations to 26% of large organizations.

4.2.3 Cellular Telephones

Cellular telephone service is available in several, but not all urban areas. It is not yet available in Saskatchewan, Manitoba or New Brunswick. However, it should be noted that in some cases respondents confused cellular phone service with radio phones since they were not aware of the technology differences. At the time of the survey, cellular telephone service was just being introduced or was not available in some regions and probably confused respondents. Therefore, the survey results on cellular phones have not been reported due to the lack of reliability of the findings.

In those urban centres where cellular telephones were not available, large businesses participating in the workshops felt that the image of their community suffered, due to the lack of of this service.

Generally, workshop participants also felt that the quality of service was good across the country. Initial capital equipment and usage charges were considered major barriers to increased penetration of cellular phone units.

4.2.4 Mobile Two-way Radios

More than one quarter (28%) of firms surveyed had mobile two-way radios (Table 4.19). This ranged from 20% in Newfoundland to 43% in Alberta and from 9% in manufacturing to 53% in transportation/communication/utilities. Across organization sizes, mobile two-way radio usage ranged from 19% of small organizations to 41% of large organizations. Among firms, the average number of mobile two-way radios was 7.0, although the median number was 3.0 (Table 4.20). This median number held, with little variation, across all

TABLE 4.17

Telecommunications Services Used (Q.28)

	Total Sample
Sample Size	591
Teleconferencing	24%
Public electronic mail (e.g., Envoy, EOS)	6%
Data base services (e.g., iNET)	8%
Wide area telephone service (WATS)	14%
Zenith or 800 service	23%

TABLE 4.18

Planned Increase In The Use Of Telecommunications Services (Q.29)

	Total Sample
Sample Size	555
Teleconferencing	17%
Public electronic mail (e.g., Envoy, EOS)	9%
Data base services (e.g., iNET)	15%
Wide area telephone service (WATS)	14%
Zenith or 800 service	20%

TABLE 4.19

Use Of Telecommunications Equipment (Q.25)

	Total Sample
Sample Size	589
Mobile 2-way Radios	28%
Paging Units	27%
TWX/Telex Machines	24%
Fax Machines	16%

TABLE 4.20

Telecommunications Systems Characteristics (Q.24, 25)[1]

	Total Sample
Sample Size	589
Incoming lines (mean)	5.6
Incoming lines (median)	3.0
Mobile 2-way radio (mean)	7.0
Mobile 2-way radio (median)	3.0
Paging units (mean)	6.2
Paging units (median)	2.0
TWX/Telex machines (mean)	1.2
TWX/Telex machines (median)	1.0
Fax machines (mean)	1.1
Fax machines (median)	1.0

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[1] Indicates only firms with the above equipment.

provinces/territories, all industrial sectors, and for all organization sizes, indicating that even small firms depend on mobile radios.

Mobile two-way radios are an alternative to cellular telephone service in outlying areas of the country. In heavily populated areas, cellular telephone service will likely replace mobile two-way radios as the cost of cellular telephone service declines. For some firms, radio interference from truckers was a problem.

4.2.5 Paging Units

Paging units are seen to be cost-effective and are widely available across the country. However, the lack of paging services in rural areas hampers the operation of certain types of businesses. For example, banks have difficulty communicating with their ATM repairmen in rural areas when paging services are not available.

Based on the survey, more than one-quarter (27%) of firms had paging units (Table 4.19). This ranged from 10% in the Yukon to 30% in New Brunswick and British Columbia, and from 17% in agriculture/forestry/fishing to 35% in the manufacturing and government/non-profit sectors. Across organization sizes, paging unit usage ranged from 8% of very small organizations to 55% of very large organizations. Among all firms the average number of paging units was 6.2 with a median of 2.0 units (Table 4.20). This median number of units held with little variation across regions, industrial sectors and organization sizes.

4.2.6 TWX/Telex and Facsimile Machines

Across the country there has been a trend away from the use of TWX/Telex machines and towards the use of facsimile machines. Nevertheless TWX/Telex machines do continue to serve market niches requiring written international communications such as financial institutions and firms with overseas communication needs.

The survey indicated that approximately one-quarter of the firms had TWX/Telex machines (24%) and 16% had Fax machines (Table 4.19). Among these firms the average number of TWX/Telex machines and Fax machines was 1.2 and 1.1 machines, respectively, with a median of 1.0 machine for each (Table 4.20).

In the workshops, large businesses indicated that their use of facsimile machines showed strong growth, partly at the expense of TWX/Telex machines, but this varied according to destination. TWX/Telex are used worldwide, while facsimile machines have a more limited level of penetration, particularly in North America and Europe. Communications to other regions are often done through other means, since Telex machines are often considered high technology in other areas of the world.

Across regions, the proportion of firms with TWX/Telex machines ranged from 11% in Prince Edward Island to 40% in Newfoundland and the Northwest Territories. The proportion of firms with Fax machines ranged from 6% in the

TABLE 4.21

Telecommunications Services Used (Q. 28)

	Total Sample
Sample Size	591
Zenith or 800 service	23%
Teleconferencing	24%
Wide area telephone service (WATS)	14%
Data base services (e.g., iNet)	8%
Public electronic mail (e.g., Envoy, EOS)	6%

TABLE 4.22

Planned Increase In the Use or Start In Use Of Telecommunications Services (Q.29)

	Total Sample
Sample Size	555
Zenith or 800 service	20%
Teleconferencing	17%
Data base services (e.g., iNet)	15%
Wide area telephone service (WATS)	14%
Public electronic mail (e.g., Envoy, EOS)	9%

Yukon to 31% in Quebec. Across industrial sectors, the proportion of firms with TWX/Telex machines ranged from 9% in agriculture/forestry/fishing to 40% in wholesaling, while the proportion of firms with Fax machines ranged from 8% in agriculture/forestry/fishing and government/non-profit to 29% in finance/insurance/real estate. Across organization sizes, TWX/Telex usage ranged from 8% of very small organizations to 54% of large organizations, while facsimile usage ranged from 2% of very small organizations to 42% of large organizations. There were no regional, industrial or organizational size variations in the median number of 1.0 of TWX/Telex and Fax machines.

The wide use of facsimile machines by large telecommunications users was due to four factors:

- recent improvements which allow different manufacturers' machines to communicate with each other,
- much faster transmission speeds offered by the new machines,
- better transmission quality, and
- a large user base.

The importance of facsimile machines to large organizations is underlined by the fact that some organizations now require that their suppliers have facsimile machines.

The growth of facsimile machines has come partly at the expense of TWX/Telex machines and partly at the expense of courier services. One barrier to continued growth of facsimile machines is the lack of a current facsimile directory in Canada. Some participants felt that facsimile machine manufacturers are reluctant to provide a list of firms who they serve because of competitive reasons.

4.2.7 Teleconferencing

Audio teleconferencing is also widely available across the country. Teleconferencing usage of survey respondents was reported by 24% of organizations (Table 4.21) and ranged from 13% in Newfoundland to 36% in the Northwest Territories. Across industrial sectors, teleconferencing usage ranged from 13% in wholesaling to 48% in the government/non-profit sector. Across organization sizes, teleconferencing usage ranged from 6% of very small organizations to 43% of large organizations.

Future usage of teleconferencing varied among survey and workshop participants. Seventeen per cent of smaller businesses indicated that they planned to increase their use of teleconferencing (Table 4.22). This ranged from 9% in Prince Edward Island and British Columbia to 24% in Ontario. Across industrial sectors, expected increases in teleconferencing usage ranged from 7% in mining to 31% in the government/non-profit sector. Across organization sizes, increased teleconferencing usage ranged from 8% in very small organizations to 27% of larger organizations.

As with several other services, cost was cited as the single most important factor in the decision by smaller businesses to increase their use of teleconferencing. This was closely followed by the availability of teleconferencing services.

By contrast, larger organizations indicated little or no increase in their demand for audio teleconferencing, although they might have some demand for specialized applications such as some community colleges use teleconferencing services to hold classes in remote areas. One factor limiting teleconferencing usage is the ability of modern PBXs to provide teleconferencing features.

The growth of video conferencing is limited by high costs, arrangement times and the lack of studios in many cities. Most large users cannot justify constructing their own studios and find using other telco's studios inconvenient.

4.2.8 Public Electronic Mail

Public electronic mail is used primarily by larger businesses and the government. Usage among smaller organizations, as identified through the survey, was a scant 6% (Table 4.21). Across industrial sectors, usage ranged from 2% in construction and finance/insurance/real estate to 9% in transportation/communications/utilities. In addition, usage ranged from 2% in Manitoba and Newfoundland to 11% in New Brunswick and the Northwest Territories. Across organizations sizes, public electronic mail usage ranged from 2% of very small organizations to 12% of large organizations.

Workshop participants who were prime users of public and private electronic mail systems were divided over whether public electronic mail would grow substantially in the future. Although public electronic mail systems such as Envoy are widely available across the country, limits to growth included:

- in-house development of many private electronic mail systems which are not compatible with public systems,
- competition from the new facsimile machines which are faster and do not require the keyboard entry that electronic mail does,
- the difficulty of using public electronic mail systems,
- the lack of a critical mass of users,
- the lack of access to American users,
- the difficulty of using it for special applications, and
- its high cost, especially for the small user.

Interestingly, those participants who supported continued growth for public electronic mail saw facsimile machines as its compliment rather than a substitute.

Smaller businesses responding through the survey indicated that only 9% planned increases in the use of public electronic mail (Table 4.22). This ranged from 2% in Nova Scotia and Manitoba to 16% in the Northwest Territories. Across industrial sectors, planned increases in public electronic mail ranged from 2% in construction to 17% in manufacturing. Across organization sizes, planned increases in public electronic mail usage ranged from 5% of very small organizations to 19% of larger organizations. The primary reasons given were the lack of service availability (26%) and cost factors (32%) (Table 4.23).

4.2.9 Wide Area Telephone Service (WATS)

Wide area telephone service (WATS) is available across the country with the exception of the far North where the lack of WATS service hampers Northern businesses which try to serve large areas. For example, travel agents have difficulty serving customers in remote areas of the far North because of the lack of WATS zones.

Through the survey, smaller businesses indicated that 14% of organizations used WATS (Table 4.21), ranging from 7% in Newfoundland to 20% in Ontario and Manitoba. Across industrial sectors, WATS usage ranged from 6% in agriculture/forestry/fishing to 24% in wholesaling. Across organization sizes, WATS usage ranged from 3% of very small organizations to 34% of large organizations. Of these businesses, 14% indicated planned increases in usage (Table 4.22). Regionally, planned increases in usage ranged from 4% in Prince Edward Island to 22% in Ontario. Across industrial sectors, planned increases in WATS usage ranged from 0% in mining to 21% in wholesaling. Across organization sizes, planned increases in WATS usage ranged from 5% in very small organizations to 30% in large organizations.

Several specific concerns were expressed by larger organizations about WATS service through the workshops. These included:

- WATS service, with its zone and usage charges, is often no longer cost-effective in comparison with the new direct dialing rates,
- the cost of WATS service bears no relationship to the cost of providing the service and, therefore, is not priced most efficiently, and
- the inability of small users to make use of WATS service due to its high cost and its zoned cost structure.

One source of future WATS growth is likely to result from increased telemarketing activities by Canadian businesses.

4.2.10 Zenith or 800 Service

Zenith or 800 service is widely available across the country, except in the far remote North where surcharges must be paid to access the rest of the country. Zenith or 800 service usage was reported by 23% of smaller organizations (Table 4.21) and ranged from 9% in Prince Edward Island and New Brunswick to 73% in the Yukon. Across industrial sectors, Zenith or 800 service ranged from 3% in mining to 35% in the government/non-profit sector. Across organization sizes, usage ranged from 18% of medium organizations to 35% of large organizations.

TABLE 4.23

Factors Affecting Increased Usage Of Telecommunications Services (Q.30)[1]

	Teleconferencing	Public Electronic Mail	Database Services	WATS	Zenith or 800 Service
Sample Size	116	76	108	97	137
Cost[2]	35%	32%	39%	48%	30%
Lack of service availability	30%	26%	32%	19%	41%
Quality of service	17%	17%	19%	18%	13%
Other	38%	38%	31%	38%	30%

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[1] Asked of those respondents whose organizations indicated increased usage of existing services or start of use of new services. In addition, those who did not know about planned use indicated factors that might help them decide.

[2] Users were asked about service costs as a business input. This can also be seen as the price charged by the telcos.

Among this group, planned increases in Zenith or 800 service usage ranged from 6% in Prince Edward Island to 63% in the Yukon (which may reflect its dispersed market) with a national average of 20% (Table 4.22). Across industrial sectors, 0% of mining firms are planning to increase their Zenith or 800 service usage compared with 29% of retailing and government/non-profit organizations. Across organization sizes, planned increases in Zenith or 800 service usage ranged from 18% of the very small firms to 23% of large organizations.

Specific concerns which were expressed by workshop participants representing large firms regarding Zenith and 800 services include:

- the high cost of Zenith and 800 services,
- the inability of small users to make use of Zenith and 800 services, and
- the lack of telco encouragement for the use of Zenith and 800 services.

Demand for Zenith and 800 services could be increased if price and hence costs to users were reduced, thus providing businesses an available means of accessing larger market areas or facilitating liaison with suppliers.

4.2.11 Future Use of Telecommunications Services

Business organizations were asked through the survey to indicate whether they planned to increase their use of telecommunications services, or if not currently using some services, whether they planned to start using them within the next 2 to 3 years. Table 4.22 shows the planned increase in use or start of use of each service. With the exception of electronic mail, the range of increase was fairly narrow, between 14% and 20% across services. In addition, the proportion of respondents indicating that they did not know about future service usage was generally around 6% to 7%. Factors influencing future use of services are lack of service availability and costs, as well as other factors such as need and lack of expertise (Table 4.23).

These survey results when combined with the discussions in the workshops suggest that familiarity of businesses with the range of available telecommunications services, their costs and, more importantly, their benefits to business are not well understood. Thus, while respondents generally had good knowledge about their use of equipment, the service features of telecommunications are less well known as evidenced by the significantly higher proportion of "don't know" responses to services questions. Workshop participants suggested that this stems in part from the lack of promotion, including the benefits and "user friendliness" of particular services by the carriers. This is further compounded by the internal separation of services (e.g. data and voice) within some telcos, particularly at a time when the technological integration of computing and telecommunications is occurring.

TABLE 4.25

Use Of Dedicated Lines Or Private Networks (Q.26)[1]

	Total Sample
Sample Size	541
Yes, uses dedicated lines or private networks	22%
No, doesn't use dedicated lines or private networks	78%

[1] Asked of those respondents whose organizations use computers but not data communications.

TABLE 4.26

Dedicated Line Or Private Network Usage (Q.27)[1]

	Total Sample
Sample Size	110
Voice	72%
Data	28%
Video	2%

[1] Ask of those respondents whose organizations use computers but not data communications.

4.2.12 Telecommunications Systems Characteristics

Almost one-quarter (22%) of the smaller organizations surveyed have dedicated lines or use private networks (Table 4.25). Across regions, the proportion of organizations using dedicated lines or private networks ranged from 11% in Prince Edward Island and New Brunswick to 45% in Saskatchewan. Across industry sectors, usage of dedicated lines or private networks ranged from 11% in agriculture/forestry/fishing to 30% in the government/non-profit sector. Across organization sizes, dedicated line usage ranged from 9% of very small firms to 45% of large organizations.

Dedicated lines and private networks are used for voice communication (72%) data communication (28%) and video transmission (2%) (Table 4.26). The small sample size precludes regional or industrial sector breakdowns.

4.2.13 Overall Assessment of Telecommunications Services to Canadian Business

Two key factors affecting the current and planned usage of telecommunications services across all types of Canadian businesses are availability and cost. Specifically, these have regional dimensions:

- The availability of certain services, especially data communication services, is limited in some rural areas, making it difficult to operate data networks in rural areas.

- The quality of maintenance and repair service in rural areas is uneven, especially for data communications.

- The cost of data communications in particular is higher in remote and rural areas, as competition within major urban centres with a larger customer base favours these users.

- In remote Northern communities, the provision of services is limited and the quality of service is poor. Satellite service is often disrupted by power outages, the lack of repair parts and the lack of skilled repair personnel.

Service availability may be limited in some areas because of regulatory constraints, and different services may be delivered through several companies. Also, the quality of lines is important, particularly for data communications. Equipment quality is perceived to vary geographically, suggesting another limitation to data communications used by businesses located in poorer quality areas. This has cost and competitive implications.

Cost emerged as the top factor affecting planned increased usage of services, across all sectors, regions and business sizes. Despite the expressed importance of basic telephone service as well as that of enhanced services, usage is restricted by the current price structure which limits access of

TABLE 4.27

Telecommunications Expenditures (Q.31)

	Total Sample
Sample Size	518
Equipment expenditures (mean)	$ 6,039
Equipment expenditures (median)	$ 0
Service costs (mean)	$18,501
Service costs (median)	$ 5,000

TABLE 4.28

Distribution Of Telecommunications Operating Expenditures (Q.32)

	Total Sample
Sample Size	564
Long distance services	52%
Local services	37%
Equipment rentals	5%
Leased private lines	3%
Public carrier data networks	1%
Other	1%

businesses - particularly smaller ones - to services which would potentially improve their customer/supplier relations, expand markets and improve cost-competitiveness. While telecommunications expenditures often represent a relatively small proportion of overall operating costs, businesses are trying to be more cost-effective.

There is some degree of regional disparity in the provision of these telecommunications services, not so much between provinces and regions, as within provinces on an urban/rural basis.

4.3 For Most Businesses, Telecommunications is a Relatively Small Proportion of Overall Expenditures, But is Viewed as Having Potential for Savings

For most organizations, regardless of size, total telecommunications spending are a relatively small proportion of total operating expenditures. This varies according to the sector of operation.

In the survey, smaller organizations reported a mean equipment expenditure in 1986 of $6,039. (Table 4.27). However, more than 50% of the organizations surveyed did not make any expenditures on telecommunications equipment. Across all provinces/territories, the average equipment expenditure varied from $13,006 in the Northwest Territories, to a low of $584 in New Brunswick. On a sectoral basis, the range in mean equipment expenditures was narrower, varying from a low of $1,494 in the mining industry to a high of $10,665 in the retail sector. Not surprisingly, equipment expenditures varied significantly according to organization size. Very small firms spent only $575, while the larger firms spent just over $19,000.

The average annual telecommunications service cost reported by respondents was $18,501 (Table 4.27). However, the median average was $5,000 which indicated that service costs are skewed rather than evenly distributed. Across regions, average service costs ranged from $6,022 in the Yukon to $30,942 in Saskatchewan. Across industrial sectors, average service costs ranged from $7,217 in the agriculture/forestry/fishing sector to $37,000 in the manufacturing sector.

The majority of telecommunications operating expenses were incurred for long distance services (52%) and local services (37%) (Table 4.27). Equipment rentals (5%), leased private lines (3%) public carrier data networks (1%) and other (1%) make up the remaining amount (Table 4.28). Across regions, the portion of expenses comprised of long distance services ranged from 41% in Ontario to 71% in the Northwest Territories, while local service costs ranged from 18% in Saskatchewan to 50% in New Brunswick and Nova Scotia.

Across industrial sectors, the portion of expenses made up of long distance services ranged from 46% in the service sector to 60% in retailing, while local service costs ranged from 31% in retailing to 43% in the construction and government/non-profit sectors. There was little variation across organizational size.

TABLE 4.29

Size Of Telecommunications Cost Changes To Business During The Past Three Years (Q. 34)

	TOTAL SAMPLE					
	Leased Private Lines	Public Carrier Data Network	Local Telephone Service	Long Distance Telephone Service	Equipment Rental Lease	Equipment Capital Cost
Sample Size	110	44	540	526	177	539
More than 50% Increase	2%	7%	3%	5%	5%	5%
26% to 50% Increase	4	0	4	6	2	3
10% to 25% Increase	24	16	29	31	17	17
Less than 10% Increase	22	11	24	21	16	7
No change	47	61	36	33	52	67
Less than 10% Decrease	1	0	2	3	3	1
10% to 25% Decrease	1	0	2	1	3	1
26% to 50% Decrease	0	5	0	0	1	0

Note: Percentage details may not add due to rounding.

TABLE 4.30

Whether Organizations Receive Good Value For Telecommunications Expenditures (Q.37)

	Total Sample
Sample Size	577
Yes, Receives Good Value	87%
No, Doesn't Receive Good Value	13%

About one-half (47%) of the respondents indicated that their expenditures on leased private lines had remained unchanged in the past three years, 22% indicated that their expenditures had increased by less than 10%, and 24% indicated that they had increased their expenditures on leased private lines by 10% to 25% (Table 4.29). Sector and organization size breakdowns were difficult to interpret due to the small sample sizes involved.

A majority of respondents (61%) also indicated that their public carrier data network expenditures had not changed in the past three years. However, 11% indicated they had increased public carrier data network expenditures of less than 10%, while 16% indicated increases of between 10% and 25% (Table 4.29). Again, small sample sizes made regional, industrial sector and organization size breakdowns difficult.

About one-third (36%) of respondents, indicated no change in local service expenditures, while 24% indicated increases of less than 10%, and 29% indicated increases between 10% and 25% (Table 4.29). The proportion of respondents experiencing local service expenditure increases between 10% to 25% ranged across industrial sectors from 43% in agriculture/forestry/fishing to 13% in the government/non-profit sector.

One-third (33%) of respondents indicated no change in long distance expenditures while 21% indicated increases of less than 10%, and 31% indicated increases of between 10% to 25% (Table 4.29). The proportion of respondents experiencing long distance expenditure increases between 10% and 25% ranged across regions from 16% in British Columbia to 46% in Manitoba, and ranged across industrial sectors from 16% in mining to 43% in agriculture/forestry/fishing.

Approximately one-half (52%) of the respondents indicated that they had experienced no increase in telecommunications equipment rental costs. About 16% experienced increases of less than 10% (Table 4.29) and 17% experienced increases between 10% and 25%. Sample size limitations do not permit regional, industrial sector and organizational size comparisons.

Finally, the majority of respondents (67%) indicated that there were no changes in telecommunications equipment capital cost (Table 4.29). About 7% indicated increases of under 10%, and 17% indicated increases between 10% and 25%. The proportion of respondents experiencing telecommunications equipment cost increases between 10% and 25% ranged across regions from 9% in Saskatchewan to 28% in Quebec, and ranged across industrial sectors from 11% in the service sector to 22% in government/non-profit.

As a summary question, respondents were asked whether their organizations received good value for their telecommunications expenditures (Table 4.30). The number of respondents indicating good value for their telecommunications expenditures ranged across regions from 68% in the Northwest Territories to 95% in Ontario, and across industrial sectors from 79% in transportation/communications/utilities to 94% in mining. There was little variation across organizational size.

Workshops provided an opportunity for businesses to explain how thev approached decision-making with respect to telecommunications costs. Participants indicated that today's highly competitive business environment is forcing all organizations to examine all cost areas for potential savings. Telecommunications services are no longer viewed as an uncontrollable cost centre despite their essential nature.

There are several reasons for this, notably the range of options available to effect telecommunications. For example, electronic mail cost-effectiveness lies, in part, in its elimination of the personal conversation associated with voice communication, reduction in clerical staff time, and the ability to access several parties. Also, businesses are becoming more selective in their choice of services. The lack of significant increases in teleconferencing were attributable, in part, to the limits of this method of communication. While it has reduced travel costs for some organizations, it is generally believed to be most effective with participants who know each other, and who are dealing with a routine agenda. Teleconference can be helpful in cases where decision-making is required for crisis matters involving several perspectives.

On a regional basis, concern was expressed about variations in the rates for services. In many instances, particularly in areas outside major centres, services charges were perceived to be excessive relative to the cost of providing the services; this was especially the perception of the large businesses participating in the workshops. For this reason, businesses located in these areas may be disadvantaged by high telecommunications costs. This, in turn, may make some areas less attractive as business locations. As a result, organizations may choose not to locate operations in these areas, or keep their organizational units in these regions to a minimum.

A final concern is the uncertainty about the effects of telephone distance rate rebalancing upon the costs of other telecommunications services, particularly as it might apply regionally. Variations in costs may change the relative cost-effectiveness of some services and, hence, affect the selection of service options. Many organizations have substantial capital costs invested in specific services and are concerned about achieving the desired return of this investment.

In summary, while telecommunications costs are generally a small part of total operating costs, many organizations regularly review these costs for potential increased savings. This, together with the expected impact of rate rebalancing on services rates, is altering the relative preferences for telecommunications services, particularly given perceived regional variations in cost structures.

4.4 Telecommunications Services Are Important to Business Profitability and Growth, But Less Significant to Location and Cost-competitiveness

The issue of telecommunications infrastructure as support to Canadian business has several dimensions. Several critical factors were identified due to their relationship to regional economic development, including:

TABLE 4.31

Impact Of Telecommunications Advances And Improvements Upon Organizations (Q.38)

Total Sample

	Overall Profitability	Growth Revenue/ Business	Geographical Market Expansion	Productivity	Cost Competitiveness	Location of Organization
Sample Size	560	554	543	563	538	539
Very Positive	11%	9%	7%	10%	6%	6%
Positive	50	50	26	45	33	27
No Impact	37	40	64	43	57	64
Negative	2	2	3	2	3	4
Very Negative	0	0	0	0	0	0

Percentage details may not add due to rounding

For Sample of Very Positive, Positive and No Impact

	Overall Profitability	Growth Revenue/ Business	Geographical Market Expansion	Productivity	Cost Competitiveness	Location of Organization
Sample Size	550	545	527	552	522	519
Positive Impact	62%	60%	34%	56%	41%	33%
No Impact	38	40	66	44	59	67
Statistical Significance (provincially)	.0098	.0029	.1439	.0001	.1379	.0031

TABLE 4.32

Whether Organizations Face Competitive Disadvantage Due To Telecommunications Costs (Q.39)

	Total Sample
Sample Size	558
Yes, Costs Create Competitive Disadvantage	24%
No, Costs Do not Create Competitive Diadvantage	76

TABLE 4.33

Whether Organizations Face Competitive Disadvantage Due To Telecommunications Service Availability (Q.40)

	Total Sample
Sample Size	563
Yes, Availablity Has Created Competitive Disadvantage	19%
No, Availability Has Not Created Competitive Diadvantage	81

- overall profitability,
- growth in revenues/business,
- productivity,
- geographical market expansion,
- cost-competitiveness, and
- location of the organization.

Survey responses from smaller organizations provided data to quantify the importance of these factors (Table 4.31). In the first part of the table, responses are shown on a five-point scale ranging from very positive to very negative. Given the sample size, the number of response categories and the very low number of negative and very negative responses, the answers were collapsed to test for statistically significant variations on a provincial/territorial, sectoral and size basis.[1] These results are shown in the lower part of Table 4.31, and are discussed in the following sections. In addition, variables such as whether telecommunications services had an impact on the competitive position of a company and/or on the choice of location were also examined (Tables 4.32 and 4.33).

4.4.1 Overall Profitability and Revenue Growth

Through the survey, small and medium-sized organizations were asked whether improvements and advances in telecommunications services have had an impact on the overall profitability of their organization. The majority of respondents (62%) indicated that development in services had a positive impact on overall profitability. About 38% indicated that there was no impact. The proportion of respondents indicating a positive impact on profitability ranged significantly across regions, from 72% in Newfoundland to 43% in British Columbia, but did not vary significantly across industrial sectors or by company size.

The majority of respondents (60%) indicated that telecommunications advances had a positive impact upon growth in revenues and business while 40% indicated that there had been no impact. The proportion of respondents indicating a positive impact ranged significantly across regions from 30% in British Columbia to 80% in Quebec, and across industrial sectors from 43% in mining to 70% in wholesaling, but did not vary significantly by company size.

Larger businesses corroborated these findings in the workshops. Not only are advances in telecommunications important to profitability, but more importantly, the opportunity to take advantage of them depends crucially on the availability, which may be hampered by regulation approval. Larger businesses, those with operations outside Canada, are often exposed to new services in these markets, particularly in the United States. These include features such as call forwarding and few, if any, restrictions on interconnections. In addition, some users perceive lower rates in the United States relative to Canada to be due to technology.

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[1] Statistical significance is defined as variations between organizations on a provincial/territorial, sector or size basis which are greater than chance would allow. The threshold for statistical significance is less than .05.

Participants also believe that regulations in Canada often restrict or delay their ability to take advantage of them with the positive benefits on profitability.

4.4.2 Productivity

Advances in telecommunications was believed to contribute to productivity in a positive way by a majority of small to medium-sized organizations. While 56% indicated that telecommunications had a positive impact upon productivity, some respondents (44%) indicated that it had no impact. The proportion of respondents indicating a positive impact upon productivity ranged significantly across regions from 26% in British Columbia to 82% in Quebec. Although the variation between sectors was statistically not significant, the range across industrial sectors was 42% in finance/insurance/real estate to 73% in wholesaling.

4.4.3 Geographic Market Expansion

Telecommunications has a direct impact on the market sphere in which firms operate, and how they operate in different markets. There are distinct regional dimensions to this factor based on differences in service availability and costs. For example, the lack of communications services limits the extension of computer-based services into certain rural areas. Banks cannot install ATM's in rural areas because of the lack of data communications. Similarly, lottery corporations often cannot install terminals in rural areas.

In remote Northern areas, the cost of telecommunications limits the geographic market served by service organizations. For example, the number of communications served by a travel agency is limited by telecommunications costs.

Telecommunications costs and service availability also affects the quality of customer relationships. Lower telecommunications prices as a cost to users and good service availability allow organizations to increase the amount of interaction with their customers.

While positive support for the role of telecommunications in expanding geographical markets is strong among larger organizations, it is less important to smaller businesses. One-third (33%) of smaller businesses indicated that telecommunications advances had a positive impact upon geographical market expansion while 67% saw no impact upon geographical market expansion. The percentage of firms reporting a positive impact ranged across regions from 13% in British Columbia to 46% in Quebec and ranged across industrial sectors from 18% in mining to 43% in manufacturing. The proportion of respondents indicating a positive impact upon geographical market expansion did not show a statistically significant difference across regions, sectors, or by company size within the sample. The difference between the perspectives of larger and smaller businesses on this issue may be attributable to the fact that smaller businesses generally focus on limited geographical markets.

4.4.4 Cost-competitiveness

Telecommunications has a positive bearing on cost-competitiveness for many organizations. Again, there are regional variations concerning its application. In the survey, 41% of smaller organizations indicated telecommunications advances had a positive impact upon cost competitiveness while 59% indicated no impact. The variation was not significant statistically across the regions, sectors, or by company size. The proportion of respondents indicating a positive impact upon cost-competitiveness ranged across regions from 18% in British Columbia to 50% in Quebec and ranged from 32% in mining to 49% in manufacturing.

About one-quarter (24%) of these businesses indicated that their organization was at a disadvantage compared to their competitors or other comparable organizations located elsewhere in Canada because of the price of telecommunications services in their area (Table 4.32). The proportion of respondents indicating a cost disadvantage due to telecommunications costs ranged across regions from 7% in Ontario to 60% in the Northwest Territories and ranged across industrial sectors from 5% in manufacturing to 32% in wholesaling. There was little variation across organizational size.

Less than one-fifth (19%) of respondents indicated that their organization was at a disadvantage compared to their competitors or other comparable organizations located elsewhere in Canada because of the availability of telecommunications services in their area (Table 4.33). The proportion of respondents indicating a disadvantage due to service availability ranged across regions from 8% in Quebec to 44% in the Northwest Territories and ranged across industrial sectors from 10% in manufacturing to 32% in transportation/communications/utilities. Across organizational size, the proportion of respondents indicating a disadvantage due to service availability ranged from 13% of large organizations to 24% of very small and small organizations.

For large business users, telecommunications costs represented between 1% and 3% of corporate operating expenditures. In the financial sector, up to 10% of expenditures were attributable to telecommunications costs, and in data processing service organizations up to 20% of their annual expenditure is spent on telecommunications. Because most of their competitors face similar telecommunications cost structures, larger users believe that telecommunications costs have minimal impact upon their cost-competitiveness.

Nevertheless, large users are concerned with telecommunications costs for three reasons:

TABLE 4.34

Importance Of Telecommunications Costs In Organization Location Decisions (Q.41)

	Total Sample	
Sample Size	564	
Very Important	14%	
Somewhat Important	17	
Not Very Important	25	69
Not At All Important	44	

Note: Percentage details may not add due to rounding.

- The absolute volume of telecommunications costs is very high for many large users; for example, a large bank can spend $50,000,000 each year on telecommunications.

- A substantial proportion of telecommunications costs are seen as being discretionary and, hence, controllable expenses.

- The establishment of telecommunications managers in many user organizations has led to a professional approach to telecommunications systems development and cost containment.

It is important to keep in mind that organizations have organized their telecommunications systems based on existing cost structures. For example, some firms located in remote areas will fly computer disks to computer centres, rather than transmitting the data via data communications systems because of cost considerations.

4.4.5 Organization Location

Only a small proportion of firms believe that telecommunications have a positive impact on their choice of location. In the survey, one-third of respondents indicated that telecommunications advances had a positive impact upon the location of their organizations and 67% indicated that there was no impact (Table 4.31). The proportion of respondents indicating a positive impact upon the location of their organizations, statistically significant on a regional basis, ranged from 15% in British Columbia to 61% in Quebec. The results, however, did not vary across sectors or by company size. Between industrial sectors, the proportion of respondents indicating a positive impact ranged from 16% in agriculture/forestry/fishing to 45% in mining.

This finding is not surprising considering the importance of other factors such as the location of markets and suppliers in the choice of location. In comparison, telecommunications costs and service availability are relatively less significant. On a less visible level, the location of the "backroom" operations of a firm such as a retail data operations is influenced by telecommunications costs and service availability. Terminal equipment restrictions in certain regions serve to discourage the location of data processing centres in those regions. The location of "frontroom" operations at the retail outlets is still driven by access to market and is more susceptible to prime locations in major centres.

Cost variations and service availability were explored to determine their effect on choice of location. Overall, only 14% of respondents in the survey indicated that the price of telecommunications services was very important in deciding where to locate their organizations (Table 4.34). In contrast, 69% indicated that telecommunications costs were not important in deciding where to locate their organizations. The proportion of respondents indicating that the price of telecommunications was very important to the location decision ranged across regions from 2% in British Columbia to 26% in Nova Scotia and Quebec and ranged across industrial sectors from 6% in the manufacturing sector to 22% in the service sector. There was little variation across organization sizes.

TABLE 4.35

Reasons For Importance/Unimportance Of Telecommunications Costs In Location Decision (Q.42)

	Total Sample
Reasons for Importance	
Sample Size	184
Telecommunications are important to the business	13%
Cannot afford high costs	4
Need long distance links to remote areas	4
Other factors	12
Reasons for Unimportance	
Sample Size	365
Telecommunications is not important to business	26%
Serves local market, can't relocate	22
Other factors are more important	9
Telecommunications costs are same everywhere	8
Needs service regardless of cost	7
Other factors	14

TABLE 4.36

Importance Of Telecommunications Service Availability In Organizations Location Decisions (Q.43)

	Total Sample	
Sample Size	560	
Very Important	23%	
Somewhat Important	20	
Not Very Important	20	57
Not At All Important	37	

TABLE 4.37

Reasons For Importance/Unimportance Of Telecommunications Service Availability In Location Decisions (Q.44)

	Total Sample
Reasons for Importance	
Sample Size	279
Telecom services are important to the business	23%
Need long distance links to remote areas	3
Affects profitability	3
Other factors	21
Reasons for Unimportance	
Sample Size	261
Local business, can't relocate	16%
Telecommunciations are unimportant to business	15
All services are available	6
Other factors are more important	6
Other factors	21

Main reasons given for considering the importance of telecommunications prices in the location decision were the role telecommunications played in business activities (13%), the high cost of telecommunications (4%) and the need to link remote locations through long distance telecommunications (4%) (Table 4.35). Main reasons cited for the unimportance of telecommunications costs in the location decision were the relative unimportance of telecommunications to business (26%), and the need to be near local markets (22%).

Overall, 23% of respondents indicated that telecommunications service availability was very important in making location decisions while 57% indicated that service availability was not an important factor (Table 4.36). The proportion of respondents indicating that service availability was a very important factor ranged across regions from 5% in British Columbia to 44% in Quebec and ranged across industrial sectors from 16% in the government/non-profit sector to 32% in construction and finance/insurance/real estate. Across organization sizes, responses ranged from 18% of the large organizations indicating the importance of service availability in the location decision, to 31% of the small organizations.

The main reason given for the importance of telecommunications service availability in the location decision was the relative importance of these services to the business (23%) (Table 4.37). The main reasons given for the relative unimportance of telecommunications service availability in the location decision included the local nature of the business (16%) and the relative unimportance of telecommunications to the business (15%).

4.5 Business Wants High Quality Responsive Telecommunications Service

As the previous discussion illustrates, telecommunications service, prices and availability are important to business success, although they have a less significant bearing on cost-competitiveness and location. Telecommunications can improve profitability by increasing productivity and reducing or containing operating costs. Businesses want a clear indication of the costs to users, options available and potential changes so these factors can be reflected in strategic plans.

Telcos were singled out by businesses for their lack of strategic planning and for their lack of responsiveness to customer needs. Variables such as the speed, efficiency and flexibility shown by telecommunications companies have a major impact on how easily companies can operate in a region. Customer service is so important that some workshop participants indicated that, whenever possible, they avoid establishing business operations in areas where good service is not available. Concerns expressed about telecommunications services include:

- It is too early to comment on the provision of advanced integrated networks such as ISDN.
- Telephone companies tend to focus on voice rather than data communications.

- There is a continued failure by the carrier to appreciate the essential role of telecommunications in the modern Canadian corporation, particularly for larger, multi-branched and multinational businesses.

Despite the importance of telecommunications to major businesses, the telecommunications service companies are not perceived by large businesses as being demand driven to provide the range, level and quality of services essential to business in today's global economy.

4.6 Businesses Which Operate Across Canada Want Uniformity Among Provinces

Businesses operating on a national basis feel hampered by regional variations in costs, services and regulations. This lack of uniformity of rates imposes cost burdens on businesses and, to some extent, limits the way business is conducted.

Larger organizations believe they have considerable complex telecommunications needs which are not being adequately addressed by the regulators or the telcos.

The different regulations regarding telecommunications in each jurisdiction make it difficult for national firms to operate on a national basis. Inconsistency in standards and regulations, especially in the areas of terminal attachment and resale/sharing, cause considerable frustration among large users.

The regulatory process is also perceived to be less sensitive to the needs of larger users, with regulations affecting the range and availability of new services running behind the needs of large users. This was particularly the case for users which have U.S. operations.

The pricing structure was singled out as another concern due to:

- the lack of relationship between pricing and the cost of providing that service,
- the lack of competition in several services, and
- the existence of varying patterns of cross-subsidization across regions.

Taken together, these result in a regionally fragmented system of regulations, service availability and cost structures. Large businesses operating nationally prefer consistency and uniformity of services and regulations which facilitate their use of and planning for telecommunications.

5.0 TELECOMMUNICATIONS AND REGIONAL ECONOMIC DEVELOPMENT

This profiles the telecommunications industry and the role of both the carriers and the equipment manufacturers in regional economic development. The research indicates that Canadian telcos buy over 90% of their equipment domestically. This has stimulated the growth of a strong equipment manufacturing base and spawned local centres of manufacturing in almost every major city in Canada. Case studies of Montreal, Ottawa, Saskatoon, Calgary and Vancouver examine the diversity and depth of the telecommunications manufacturing industry, and their economic contribution through linkages to other industries, sales outside the region and entrepreneurship. The results show that the benefits of economic development are uneven across the regions, although government support in many forms has begun to stimulate activity in peripheral regions, but will require continued support to reach the critical mass stage of regional development.

5.1 Telecommunications is a Necessary but Insufficient Condition for Regional Economic Development

A sample survey of telecommunications service carriers and telecommunications manufacturers (in five selected cities) was carried out in order to identify the extent that the telecommunications industry enhances regional economic development. It also supports the work in Work Modules 3 and 4 where telecommunications users revealed their perception of the role which telecommunications play in choosing business locations and in day to day operations. The main hypothesis being, if telecommunications is a core industry in the information age, then positive forward and backward linkages exist or can be promoted through the output of the telecommunications industry.

5.1.1 Telecommunications Service Carriers and Their Importance to Regional Development

Telecommunications carriers contribute to regional economic development in two ways - through the individual corporation's capital investment and employment, and by supplying telecommunications services to residents and businesses as a bridge across both local and long distances. The service carriers were asked to specify the role which they play as telecommunications service providers in supporting regional economic development in order to identify the industry's strategic importance.

The economies of the Atlantic provinces are dependent on the resource sectors. Compared to other regions, manufacturing is underrepresented, but this is not attributable to the lack of advanced telecommunications in the region, according to the telcos. This was confirmed in the findings of the telecommunications user survey (Work Module 3) and the user workshops (Work Module 4). The Atlantic telcos indicated their belief that telecommunications is a necessary, but not sufficient condition for regional economic development. Again, this was confirmed through the user survey and workshops where it was indicated that telecommunications availability and costs are an insignificant factor in an organization's locational decision relative to factors of more primary importance such as access to markets, resources, etc. The key issue, however, may not be the impact of telecommunications on locational decision-making, but rather the availability of services to meet the needs of the region's businesses in an increasingly global competitive environment.

Two Atlantic telcos - Maritime Telegraph and Telephone and Newfoundland Tel - have also provided their perspective on the issue in a recent study.[1] Both companies agree that a developed telecommunications infrastructure will enhance regional economic development initiatives but, when isolated in itself, it is not a guarantor of regional development. The issue has to be viewed in its entirety which includes other key economic variables such as market size, labour force, local economic characteristics, etc. The level of service and telecommunications prices are by no means a deterrent for businesses to locate within the region. The carriers' role is seen to be a provider of an adequate system to meet the voice and data demands of business, much in the same way which a sufficient transportation route has in anticipation of expected demand. Once basic service is in place, it is the level of usage which determines the rate and level of service offerings and network development and thus, seeding the next round of investment by the telecommunications service provider.

In Central Canada, the technically advanced products and price competitive services within Bell territory were deemed to be positive advantages for firms proposing to locate in the area. For the regional telcos, their status as the region's largest employers and the availability of high quality services to distant business locations are key to supporting the regional economic base. However, they do have relatively higher costs in servicing many small, geographically diverse communities, and the discounts now offered for intra-provincial rates have meant lower toll revenue and revenue settlements with Bell. To maintain service quality, the cost of providing telecommunications in remote areas will have to be passed on to customers and has raised concerns over the potentially adverse effect on future business location. One regional telco expressed concern that, in spite of customer expectations, their smaller absolute market size means the company is limited in its ability to meet every customer's demand for new and advanced services.

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[1] Lesser, B. and Hall, P., Telecommunications Services and Regional Development: The Case for Atlantic Canada, Institute for Research on Public Policy, 1987, pp. 170-2.

Most telcos believe that their capital investment plans, policies to source equipment from companies with a local manufacturing presence and, in some instances, their status as one of the province's largest employers are key factors to developing the provincial economy. Moreover, the standards of telecommunications products and services, as well as prices, are consistent with those of other Canadian telcos in attracting business to locate regionally. These telcos believe that their equipment procurement policies will attract telecommunications manufacturers to these regions and the successes of the established local manufacturers will encourage related firms to locate in these provinces.

In British Columbia and the Yukon, both B.C. Tel and NorthwesTel serve numerous small communities because natural resources are located over a large geographical area. Adequate communications services, therefore, sometimes serve a more important role than a good transportation route. As the Yukon's second largest employer, after the territorial government, NorthwesTel contributes to the local economy with its employment, spending on local goods and services, and fulfilling the communications requirements of industries such as mining and oil and gas companies.

CNCP is centralized in Toronto and, probably, does not create as many economic spin-offs regionally as the corporation would prefer. With the growth of the service economy, particularly in a large country such as Canada, information transfer has become essential. CNCP sees the role of communications as a logical extension to its historical function as a transporter of goods.

Teleglobe takes an international view in its assessment of regional development. The company believes that the adoption of modern technology implies eventual cost savings which will ultimately benefit customers with reduced prices. This could help ensure that large users utilize established Canadian telecommunications networks as the competitiveness of Canadian services is improved, thus avoiding international bypass.

In summary, the availability of telecommunications services is esential to the competitiveness of Canadian businesses in the global economy, but is not the key locational decision-making factor. The service carriers also play an important regional economic development role through their capital expenditures locally, employment generating capacity, and equipment purchase orientation which favor provincial or Canadian suppliers.

5.1.2 Telecommunications Manufacturers and Their Importance to Regional Development

In order to assess the contribution to regional development by the telecommunications manufacturing industry in the selected urban centres, four criteria were considered:

Table 5.1

Key Characteristics of Telecommunications
Manufacturing Firms

Montreal

Company	Year Established	Ownership	Number of Employees (1987)	Range of Products	Revenue Growth In Last 5 Years	R&D Spending In Dollars Or As A % Of Revenue
Canadian Marconi	1903	Public/ GEC-U.K. 52%	2350	• Tactical Radio Communications • Telex Exchanges, Radios, Helicopter Radar • Special Services	10% Annual Rate	12-15%
Codalex Ltd.	1975	Private/ Canadian	54	• Multiplex Equipment • Amplifiers and Ancilliary Items	10% Annual Rate	2%
Comterm Inc.	1970	Public/ Canadian	360	• Terminals • System Software (LANs) • Electronic Manufacturing • Servicing and Maintenance	4 Times	10%
Datagram Inc.	1976	Public/ Canadian	75	• Communications Processors • Statistical Multiplexers • Modems • X-25 pads • Servicing	5.5 Times	10%
Harris-Farinon Canada Inc.	1970	Public/ Subsidiary of a U.S. Company	300	• Microwave Radios • Multiplex Equipment • Fibre Optic Terminals	15% Annual Rate	5-7%
MPB Technologies	1977	Private/ Canadian	95	• Contract R&D and Engineering • Radar Systems - Customized • Digital Graphic Systems (Broadcasting) • Laser Communication	Tripled	5%

- The diversity and depth of firms in each urban centre, and the synergy and linkages between them and other suppliers and markets.

- The ability to generate sales outside of the region and, preferably, outside of Canada, whereby remittances to the firms located in the region ultimately raises the area's balance of payments.

- The ability for firms to generate continued regional growth in employment, either through internal expansion or in terms of the absolute numbers of new firms being established.

- The ability of local scientific elite to become successful entrepreneurs which indicates the level of indigenous innovativeness in the region. Although this indicator is intangible in nature, the telecommunications manufacturing industry requires a commitment to technological advance which increases the success for product innovation.

Evaluation of the genesis and growth of the pockets of telecommunications manufacturing activity using these criteria has facilitated the comparison of centres selected for study and the development of conclusions about their contribution to regional economic development.

a. Montreal

A list of the companies surveyed and relevant corporate information are found in Table 5.1.

By the first criterion of gaining the broadest possible customers' base, only two of the twelve companies contacted - MPB Technologies and Pylon Electronics - reported that they are dependent upon the domestic Canadian market. MPB relies upon contract R&D from the Canadian government, and Pylon Electronics provides the local telco with power conversion equipment. All the remaining Montreal-based firms are receiving at least half of their annual revenue from sales abroad. In some instances, Codalex and S.R. Telecom reported that as much as 90% to 95% of sales revenue is derived from exports. The reasons for this export-orientation for the Montreal telecom manufacturers can be narrowed down to two features:

- The domestic market is too small, particularly when Northern Telecom dominates by accounting for about 80% of the Canadian equipment market, so companies need to look abroad for sales growth.

- Following the AT&T break-up in 1984, the United States' market has expanded for Canadian manufacturers. Canadian products are also more attractive following the depreciation of the Canadian dollar since 1984. This is a large and growing market demanding a wide range of products. As a result, there are many niches for specialty products, often with only a small number of highly competitive suppliers.

TABLE 5.1
(Cont'd.)

Key Characteristics of Telecommunications Manufacturing Firms

Montreal

Company	Year Established	Ownership	Number of Employees (1987)	Range of Products	Revenue Growth In Last 5 Years	R&D Spending In Dollars Or As A % Of Revenue
Memotec Data	1977 (incorporated in 1983; previously a division of International Systcoms Ltd.)	Public/ Canadian	1050	• Communication Processors • Network Management Diagnostics • System Integration • Network Design	18 Times Since 1983	12%
Northern Telecom	1973	Public/ Canadian	1500	• Transmission Equipment Including Multiplexing, Fibre Optics Related Radio Transmission and Voice Frequency	N/A	11% (corporate wide or $474 million 1986)
Positron Inc.	1970	Private/ Canadian	250	• High Density Key System • Specialty Telephones • Voltage Protection Equipment • Integrated Radio/ Telephone Consoles	60% Annual Rate	10-11%
Pylon Electronic Company Ltd.	1955	Private/ Canadian	55	• Power Conversion Equipment • Transportation Cases	Doubled	15%
Spar Aerospace	1977	Public/ Canadian	2000	• Satellites • Earth Stations • Canada Arm Robotics (Artificial Intelligence)	13% Since 1982	3% (excluding work carried out for customers)
S.R. Telecom Inc.	1981	Public/ Canadian	270	• Microwave Equipment • Satellite Microwave • Switches	35% Annual Rate	10-12%

For Northern Telecom, the increased choices to United States' consumers have enabled Nortel to gain a sizeable market in the United States for some of its superior leading-edge products. Foreign earnings for Montreal-based firms are sustaining the industry's growth and contribute to regional development by the presence of the industry.

In terms of employment opportunities, the absolute growth over the survey period for each corporation, cyclical fluctuations or job losses through either reduction in sales or process innovation, were not captured. The combined employment of four large companies (Nortel, Spar, Canadian Marconi and Memotec Data) reaches almost 7,000. The medium-sized companies have an additional 1,450 employees. Employment at major plants long established in the Montreal area has grown, particularly over the past five years. This has been supplemented by job creation at new plants established since 1975. Thus, the telecom manufacturers are significant and growing employers in the Montreal area, at least within the five-year period surveyed.

The ability for local entrepreneurs to start up new enterprises or take over established businesses confirms the third criterion for contribution to regional development - the availability of indigenous innovative resources and a solid foundation of financial and management expertise. The prime examples in Montreal include: SPAR's take-over of the RCA plants and its growth to be a leader in Canadian satellite and aerospace engineering; Memotec's roots as a venture capital enterprise and its recent expansion by acquiring Teleglobe Canada; and S.R. Telecom's growth from a four-person operation in 1974 to a company with $16 million sales in 1986 and employing 270 at present.

Although the presence of innovative entrepreneurs is important to local economic advance, where the development of these innovations occurs may be a better indicator of longer-term potential within a region. Hence, in-house product development may more accurately reflect the innovative and resource base of industrial establishments than the mere introduction of new or improved products developed elsewhere. To this end, Table 5.1 indicates that, on average, the Montreal companies interviewed spend about 10% of their annual revenue on R&D activities in-house. Moreover, the high degree of proprietary products being developed by these Montreal firms confirms the well-founded base of innovative resources in the region.

Overall, the Montreal case study indicates the telecommunications manufacturing industry is a major contributor to regional development in the area. The export potential for the companies, a healthy industrial base for generating employment, and the availability of local innovative resources are all vital contributing factors.

In the Montreal area, the telecommunications manufacturers have forged well-established linkages both within and outside the industry. These are manifested in:

- A good local network of supplier or feeder firms which minimizes the shipping time for components and raw materials.

- Skilled labour and electronic engineering expertise are also conveniently available.

- The level of competition within the local industry has increased over the last five to ten years. In addition, "high-tech" products are reported to have a rather short product life cycle. Product quality through innovation is, therefore, of paramount importance for survival. Local competition has apparently raised industry standards in general.

Although the overall linkages are apparently well founded, in some individual circumstances the synergy is less established, for several reasons:

- Being in a niche market serving the defense industry, one obviously cannot look just within Montreal for business growth.

- Being a part of an international subsidiary, many R&D and engineering inputs are available internally through the parent, and there is little need for local contacts, other than for buying raw materials.

- There was a period of time during one company's early development when sales were 100% within the province of Quebec and local connections were vital. As export sales increased, local contacts became diluted.

In terms of overall industry synergy, the best examples rest with the larger corporations:

- Spar Aerospace Ltd., through its satellite communication division, is becoming increasingly important in its role as a producer of Canada's telecommunication satellites, serving primarily Telesat Canada.

- Positron Inc. had historically supplied products to meet the specific requirements of both Northern Telecom and CNCP Telecommunications. As the company has developed proprietary products, it has reduced its dependence on specified work and looked to export markets.

- Northern Telecom's corporate integration with Bell Canada Enterprises enables the company to anticipate equipment demand from the marketplace and through its new products enhance Bell's offering of new services in return.

- More recently, the tripartite relationship between Memotec, Teleglobe and Bell Canada through the inter-corporate ownership of each other is another good example. Memotec stated that the company anticipated "a high degree of synergy" with Teleglobe as an acquisition with a promising fit with Memotec's present products.

Many medium-sized companies, which have pursued specialized market niches in the telecommunications or defense communications area, have exhausted the domestic market which implies sales abroad are vital to support continued growth. The international marketplace has become the key factor rather than the local or even Canadian market.

Table 5.2

Key Characteristics of Telecommunications Manufacturing Firms

Ottawa

Company	Year Established	Ownership	Number of Employees (1987)	Range of Products	Revenue Growth In Last 5 Years (1981-1986)	R&D Spending In Dollars Or As A % Of Revenue
Aprel Inc.	1981	Private/ Canadian	20	• Standard Testing Service for Telecommunications, Electroacquostics and Electromagnetics • Customized Prototypes of Telecom Equipment	Triple Annually	25%
Bell Canada International	1978	Canadian Subsidiary	180	• Telecom Operations Consulting • Value-Added Sales Distribution for Telecom Products	N/A (Proprietary)	N/A
Epitek International	1969	Public/ Canadian	75	• Hybrid Microcircuits	Declined About 20%	$500,000 or 11%
Foundation Instruments	1977	Private/ 80%: U.S. 20% Canadian	55	• Electro-Optic Conversion Systems	20% Annual Rate	25%
Gandalf Technologies	1971	Public/ Canadian	650 (in Ottawa) 750 (abroad)	• Modems • Private Automatic Computer Exchanges • Multiplexers, Mobile Data Transmission Equipment, Intelligent Network Equipment	20% Annual Rate	$13 million or 12%
Genesys Group	1975	Private/ Canadian	15	• Videotex Software • Videotex Technology Consulting	Stable	50%

Table 5.2
(Cont'd.)

Key Characteristics of Telecommunications Manufacturing Firms

Ottawa

Company	Year Established	Ownership	Number of Employees (1987)	Range of Products	Revenue Growth In Last 5 Years (1981-1986)	R&D Spending In Dollars Or As A % Of Revenue
Hariann Industries	1974	Private/ Canadian	4	• Antennae Multiplexers • Connectors for Radio Communication	Stable	No R&D
Idon Corporation	1983	Private/ Canadian	14	• Contract R&D in Telecom Software For Open-System Interconnect	7-Fold	20% = IDON Generated 55% = Joint Ventures 75% = Total
Intelcan Technosystems	1973	Private/ Canadian	18	• Customized Telecom Products Including Civil Aviation and Transmission, Interconnect Products	Doubled	No R&D
Jatom Systems Inc.	1979	Private/ Canadian	44	• Telephone Apparatus and Wire Tap Equipment • Surveillance Equipment and Monitoring Equipment for Correctional Services	40% Annual Rate	$250-500,000
Mitel Corporation	1973	Public 51%: U.K., 49%: Canadian	2500	• PBXs • Tone-Receivers and Generators • Tone to Pulse Convertors • LSI Circuits	Doubled	$52 million
Northern Telecom	Plant 1: 1975 Plant 2: 1980	Public/ Canadian	Proprietary	• Plant 1 - Custom Integrated Circuits • Plant 2 - Packet Switches	N/A	11% or $474 million

Overall, the Montreal case study indicates the telecommunications industry has developed from the city's roots as a major industrial area in Canada. This has allowed for both indigenous finance and a continuous stream of spin-off companies to be established and sustain the industry's momentum to create a broad and diversified telecommunications manufacturing industry in Montreal.

Three key elements emerged as stimulants to ensure growth of this core industry:

- The equipment purchasing policies of the largest service carrier in the region - Bell Canada - and the equipment supply and service contracts with smaller Quebec regional carriers.
- The awarding of future defense and aerospace-related contracts.
- Continued R&D tax credits and grants which minimizes the business and technological risks for the companies spending 10% to 15% of annual revenue on R&D.
- Export assistance where required.

b. Ottawa

A list of the companies surveyed and relevant corporate information are found in Table 5.2, opposite.

The foremost indicator of the relative significance of the telecommunications industry in Ottawa, over the last twenty years, has been the ability for the region to diversify its economic base from relying extensively on the federal government sector to that with a successful industrial base for various related high-tech companies. Such industrial advancements contributed to the growth of suburban areas such as Kanata and Nepean. Other tangible measures, such as the revenue and employment growth of the surveyed companies, also point to the contribution to regional development by the telecommunications industry.

In the area of revenue growth, almost all the firms reported solid performances over the last five years, despite the general economic conditions which included the recession of 1981-1982. The smaller firms typically reported more rapid growth in revenue, with at least a doubling or tripling of 1981 revenues by 1986. Much of the industry's growth in revenue was attributed to the following factors:

- Increasing awareness and adoption of telecommunications technology, products and services by consumers.
- Increased corporate scope through continuous innovation.
- Limited competition in Canada which prevents excessive price competition.

Table 5.2
(Cont'd.)

Key Characteristics of Telecommunications Manufacturing Firms

Ottawa

Company	Year Established	Ownership	Number of Employees (1987)	Range of Products	Revenue Growth In Last 5 Years	R&D Spending In Dollars Or As A % Of Revenue
Pylon Electronic Development Co. Ltd.	1977	Private/ Canadian	30	• Satellite Ground Stations Instrumentation (Radon Measurement Devices)	N/A (Proprietary)	$100,000 • Nuclear
Telesat Canada	1969	Canadian (owned jointly by Government of Canada and Members of Telecom Canada)	650 (across Canada)	• Satellite Communication Service in North America • Distribution of Broadcast Signals • International Consulting	Doubled	4%
Trillium Telephone	1983	Public 70%: Mitel (Mitel in turn 51% owned by British Telecom)	320	• Small Business Key Telephone Systems • Enhanced Telephone Sets	Tripled	$3 million or 6%

- Expansion opportunities in the United States, Europe and developing countries.

The one common factor contributing to the growth in revenue, for the majority of the companies, is the reliance on the export market. Not only do most of the Ottawa companies have their customers located outside of Ottawa, but also outside of Canada, particularly in the United States.

Although, in absolute terms, the revenue growth trend has been positive, many firms experienced considerable volatility in their volume of business from year to year. Niche market firms such as Epitek International, Genesys, Foundation Instruments and Bell Canada International serve narrow market segments (e.g., military, videotex, consulting to foreign telephone companies) in which the ability to win sales contracts are difficult to predict and a constantly growing revenue base, even in nominal terms, is far from guaranteed.

The contribution to job creation by the telecommunications manufacturers, particularly the major firms, has also been highly positive in terms of regional development. When viewed in a historical perspective, the growth in firms has added considerable employment to the Ottawa area.

In spite of their relatively shorter existence, the smaller and medium-sized firms generally reported faster employment growth than the majors over the last five years, but from a much smaller base. The growing market acceptance of new products was the primary cause. The shakeout in the keenly competitive international market for semi-conductors and PBXs were mentioned as primary causes for reduced employment and slower employment growth in recent years at companies such as Mitel, Epitek, Trillium and Northern Telecom. The slowing momentum of revenue growth also led to recent job losses at Genesys, Foundation Instruments and Bell Canada International. The sampling method used here was not designed to provide a quantifiable sum of the net gains in employment in the Ottawa area.

However, the fast-paced development of the industry over the last twenty years has brought highly skilled labour to locate in the region. The net gain in less tangible capital investment (such as R&D capabilities, engineering skills, elevating Canada's status in high-tech internationally, etc.) complements the physical capital investment in terms of the absolute number of new firms or jobs created.

Overall, the growth in the telecommunications industry in Ottawa has helped to diversify the economic base and raised its level of innovative resources to a critical mass level with the concentration of scientific entrepreneurs. Recent losses due to market volatility, however, point out the risky nature of the high-tech business.

The key factors needed to sustain growth and maintain regional development in Ottawa were identified by the respondents as:

- Increasing government R&D incentives, not to reinstate Scientific Research Tax Credits, but terminate the current "tinkering" of the tax credits.

- Continuing government contracts.
- Increasing export financing and marketing assistance.

The perceived levels of synergy and linkages between telecommunications manufacturing and its sub-sectors based on the interviews fall into four broad categories:

- For large companies (Mitel, Northern Telecom, Gandalf) which source raw materials from all over the world and whose final products have world mandates, little synergy is perceived. Companies such as Northern Telecom also have in-house expertise in circuit and systems design whereby the only linkages with local suppliers is on a residual basis.
- Differences in the sophistication of technology between firms implies less linkage between lower and higher-tech companies. For example, Aprel and Harriann Industries, which respectively conduct product testing and produce standard military communications equipment, have few links to their local higher-tech peers.
- A close business relationship with either a parent company or the government results in a high degree of synergy through the mutual sourcing of R&D and engineering expertise, staffing requirements, or performing to strict government guidelines (as is the case for standards testing and consulting companies).

  Some specific examples include:

  i) The Bell Northern Research (BNR) - Northern Telecom - Bell Canada International (BCI) tri-corporate relationship where BNR provides the research for Northern Telecom's products while BCI markets both corporations' technological expertise and equipment to foreign telcos in its consulting work.

  ii) Trillium - Mitel: Trillium is a spin-off of Mitel and uses the parent's R&D, engineering and marketing services for its own operations.

  iii) Telesat Canada - Department of Communications (DOC) - Telecom Canada: During the pioneering period, Telesat Canada relied solely upon the earth station research of DOC and the Canadian Research Council and, up to August, 1985, its sales arrangement with Telecom Canada was essential for its revenue base. (After the company was privatized in 1987, the continued synergy between the entities is uncertain at present.)

  iv) Aprel Inc. - DOC: This was the first DOC-accredited products testing firm to ensure all telecom products on sale in Canada conform to Canadian standards, and is benefitting from the boom in the plethora of equipment now being manufactured domestically and imported.

Table 5.3

Key Characteristics of Telecommunications Manufacturing Firms

Saskatoon

Company	Year Established	Ownership	Number of Employees (1987)	Range of Products	Revenue Growth In Last 5 Years	R&D Spending In Dollars Or As A % Of Revenue
Datatron Concepts	1981	Private/ Canadian	12	• Packet Radio • Accounting sofware[1] • Small Business Computers Manufacturing[1]	Doubling Every Year	10%
Del Computer Cable Ltd.	1983	Private/ Canadian	4	• Information/Character Display Unit	Doubled Between 1985 and 1986	$80,000 - $100,000
Develcon Electronics Ltd.	1974	Public/ Canadian	150/145[2]	• Data Switching Networks • Data PBXs • Limited Distance Data Sets	5 Times Since '81	11%
L.C. Communications	1984	Private/ Canadian	2	• Telephony O.E.M. (Engineering & Design)	20 Times Since '84	$100,000
Northern Telecom	1981	Public/ Canadian	600[3]	• Fibre Optics Cables and Related Electronics	N/A	11% (corporate wide) or $474 million 1986)
Scientific Instruments Inc.	1980	Private/ Canadian	11	• Data/voice Communication Systems	10 Times Since '81	15%
S.E.D. Systems	1965	Private/ Canadian (majority shareholder: Fleet Aerospace which is a public company)	370	• TVRO • Integrated Satellite Signals Receiver • Long Distance by-pass Systems (skyswitch)	2 to 2.5 Times Since 1981	$2-6 million

[1] Non-telecommunications products [2] 150 in Saskatoon; 145 in U.S.A. [3] Estimate

v) IDON Corporation: The company stresses "knowledge partnership" with both government and other private R&D firms in its quest for joint ventures in telecommunications software R&D.

- Firms that require experienced/skilled workers: generally small to medium-sized firms responded that DOC, BNR, Gandalf Technologies, Mitel, etc., act as a good training ground and provide a perennial source of skilled labour.

In terms of linkages, some of the best examples are seen through the supplier relationship between firms. For example, Epitek provides circuit boards for both Mitel and Northern Telecom, Telesat Canada provides a commercial outlet for DOC research (e.g., ANIK, MSAT technology), Harriann Industry provides the defense industry with customized military communication services, and Aprel Inc. offers standards testing for the manufacturers in the region.

In general, the case study reveals a high degree of synergy and linkage between telecommunications firms in the Ottawa area despite the vertical integration of some major firms in the area. To the extent that technology diffusion is promising for job creation, the examples of former DOC employees initiating Genesys and IDON, and former BNR employees establishing companies such as Mitel, Epitek International, Foundation Instruments and Aprel Incorporated, are proof of local entrepreneurs being able to sustain the momentum in Ottawa's regional development through the telecommunications industry.

c. Saskatoon

A list of the companies surveyed and relevant corporate information are found in Table 5.3, opposite.

The telecommunications industry and the growth in smaller R&D and engineering firms have contributed to the diversification of Saskatchewan's traditional reliance upon the agricultural and mining sectors for economic growth. More importantly, this diversified economic base brought with it employment opportunities for highly skilled and technologically oriented workers. The employment generating effect can be viewed in three phases of the industry's development in Saskatoon:

- First, the two established firms (Develcon and S.E.D. Systems) were able to grow from small-sized research units (with 3 to 5 partners) to 150 and nearly 400 employees, respectively. When one considers the much smaller base of high-tech related employment in the region compared to Central Canada, this ability to generate internal growth in hi-tech employment in Saskatoon is significant.

- Second, a one-time surge in employment following the establishment of the Northern Telecom fibre-optics plant enhanced the growth and value for non-farm employment in the city and in the province.

- Third, the spin-off of local entrepreneurs with the start-up of small technology firms in Saskatoon during the early to mid-1980's. The potential for these firms to grow along the line of Develcon and S.E.D. Systems could lay the groundwork towards the next phase in Saskatoon's economic development.

In terms of the investment impact, Northern Telecom reported that the Saskatoon plant's spending over the last seven years and the amount of planned investment to 1990 probably exceeds the combined investment by the balance of telecom/high-tech industries in Saskatoon. Furthermore, Northern Telecom's world mandate on fibre optics is subject to the vagaries of the international business climate. Many of the firms rely upon federal contracts to sustain growth, and the government's continued contracting in peripheral regions is, therefore, of importance to the industry in a centre such as Saskatoon. As the government has consciously funded the telecommunications industry in Saskatoon during its infancy stage, a dedicated commitment to nurture the industry out of the infancy phase of development and towards internally generated growth is vital for regional development. To this end, one common perspective by Saskatoon companies on factors critical to their continued growth is to maintain R&D tax credits and conduct faster R&D tax audits in order to receive early refunds for further R&D efforts.

The perceived level of synergy in Saskatoon is less well defined based on responses from the telecommunications industry. The key observations include the following:

- Firms generally do not compete with each other in terms of the products (e.g., the three large companies are into three different areas and serve different industries - satellite, telephone cables and data switching networks).

- Sales are predominantly outside the Saskatoon area, and the large companies are heavily dependent on the export market. The small firms tend to serve small businesses and mining corporations in Saskatchewan instead of the telecommunications service companies.

- There is only a minimal amount of sub-contracting to external assemblers. This limits the possibility of skill and technology transfer, but effectively protects one's niche market.

In terms of linkages within the telecom industry, one example is the establishment of the Advance Technology Training Centre four years ago which recognizes the need to retrain and upgrade local labourers to serve the "high-tech" industry. Furthermore, the local entrepreneurs have, in general, some former relationship with either the University of Saskatchewan or the two established local telecom firms.

On a supplier basis, there are few backward linkages at present. The majority of the companies source raw materials from wherever the most price competitive products are found. In fact, some manufacturers expressed the concern that local prices of raw materials are uncompetitive.

Table 5.4

Key Characteristics of Telecommunications Manufacturing Firms

Calgary

Company	Year Established	Ownership	Number of Employees (1987)	Range of Products	Revenue Growth In Last 5 Years	R&D Spending In Dollars Or As A % Of Revenue
Calgary Controls ltd.	1970	Private/ Canadian	13	• Loop Back Units • Remote Phones • Solid State Voice Alarms	10% Annual Rate	Confidential
Calgary Datap Systems	1969	• Subsidiary of Sandwell, Swan, Wooster • Private: 80% • Public: 20% • Canadian	75	• Remote Monitoring Control Systems (IRIS-7) • Special Engineering/ Contract Consulting	5 Times Since '81	4%
Interalia Inc.	1975	Private/ Canadian	25	• Digital Announcing Equipment • Digital Electronic Counters • Digital Customized Products	70% Annual Rate	"Substantial"
Northern Telecom	1980	Public/ Canadian	350	• Digital Key Phone Systems	N/A	11% (corporate wide) or $474 million 1986)
NovAtel Communications Ltd.	1983	50% owned by AGT (Crown Corporation); 50% owned by Nova Corporation (Public)	600	• Cellular Mobile Telephones • Mobile Phone Systems • Servicing of Cellular Products	Tripled Since '83	$10-15 million or 15%
Palco Telecommunications Ltd.	1973	Private/ Canadian	75	• Refurbishing Telephones • Servicing Telephones	10% Between 1985 and 1986	3%

Overall, the development of Saskatoon's telecommunications industry, particularly since 1980, has been positive in terms of raising the indigeneous resource of innovativeness. However, the general lack of synergy and linkage between local firms through the pursuit of a self-sustaining industry indicates the infancy of this industry in Saskatoon.

d. Calgary

A list of companies surveyed and relevant corporate information are found in Table 5.4, opposite.

The telecommunications manufacturing industry's contribution to regional development in Alberta has been mostly limited to the two large firms - Northern Telecom and NovAtel. This observation is based on the following:

- There have been only small absolute increases in terms of employment in the small to medium-sized firms. A total of about 50 new jobs were added amongst these firms over the past fifteen years.
- Only two firms depend on revenue growth through the export market. Both Calgary Datap and NovAtel are dependent upon exports for sales revenue and have reported five-fold and three-fold increases in revenue over the last five years, respectively. The revenue of the remaining firms serving the western Canadian and provincial markets only grew at generally 10% per annum. (Northern Telecom's financial results are not available by plant.)

Another interesting common factor for the small to medium-sized firms is the lack of uptake on regional development funding assistance as compared to firms of the same size in the other case study cities. One firm reported the use of the PEMD rebatable export marketing assistance program, while most firms stated that they were established in the early 1970s, before the regional development funds were made available. Recently, with the establishment of the Department of Technology, Research and Telecommunications, the provincial government has a more direct financial influence in assisting these small firms.

The city's Economic Development Authority believes it has been a marketing problem for Calgary to attract either telecom firms or "high-tech" firms in general to the city. The energy and agricultural base of the provincial economy presents an image problem. This is in spite of the presence of academic institutions such as the University of Calgary and the Southern Alberta Institute of Technology which provide a supply of skilled labour. One possible reason is the focus by academic institutions to conduct research which reflects the dominant industries in the area and are generally slow to respond to changes in the local industrial infrastructure.

Thus, one has to look to the significant presence of Northern Telecom and NovAtel to attribute the bulk of any measurable positive impact on regional development, simply because of their absolute size. NovAtel is enjoying a

Table 5.5

Key Characteristics of Telecommunications Manufacturing Firms

Vancouver

Company	Year Established	Ownership	Number of Employees (1987)	Range of Products	Revenue Growth In Last 5 Years (1981-1986)	R&D Spending In Dollars Or As A % Of Revenue
Algo Communications	1968	Private	10f 3p[1]	• Distribution/Harris Dracon • Signalling Devices • Electronic Key Telephone Systems • Servicing	Stagnant	3%
Anatek Microcircuits	1983	Public	45	• PCM Filters • T1 Repeater • Custom Circuits	34% Annual Rate	3%
Best Coil	1964	Private	9 f/2p	• Transformers • Coils • Repair & Service	5% Annual Rate	-
Circuit Graphics	1973	Private	45 f/1p	• Circuit Boards	15% Annual Rate	-
DBA Communications	1980	Private	12 f/3p	• FM Telephone • Accounting Systems • PC Software	25% Annual Rate	-
Dees Communications	1976	Private	22 f/7p	• Peripheral Equipment for KSV & PBX Phone Systems • Industrial Controls for Highway Salt/Sand Distribution	30% Annual Rate	8%

[1] Full-time employees unless otherwise indicated.
f = full-time; p = part-time

Table 5.5
(Cont'd)

Key Characteristics of Telecommunications Manufacturing Firms

Vancouver

Company	Year Established	Ownership	Number of Employees (1987)	Range of Products	Revenue Growth In Last 5 Years (1981-1986)	R&D Spending In Dollars Or As A % Of Revenue
Glenayre Electronics	1965	Public	310 f/20p	• Mobile Paging Terminals and Telephones • Modems • Converters • Caboose Replacements	5 Times	17%
Humble Manufacturing	1950	Private	20	• Custom Metalwork (Cabinet Panels Chassis, etc.)	10% Annual Rate	-
MDI Mobile Data	1978	Public (since '86)	235f 25p	• Mobile Data Communications Systems	300% Annual Rate	15-20%
Microtel	1979	Private (100% owned by BC Tel)	2100 (600 in Ont.)	• Central Office Switching • Satellite Communications • Network Management Systems • Custom Manufacturing	Negative	8%
Nexus Engineering	1982	Public	170 f/5p	• Cable TV Headend Equipment • Low Power Broadcast TV Products • Consumer Satellite Receivers • 2-way Business Satellite Products	100% Annual Rate	6%

TABLE 5.5
(Cont'd.)

Key Characterisitcs of Telecommunications Manufacturing Firms

Vancouver

Company	Year Established	Ownership	Number of Employees (1987)	Range of Products	Revenue Growth In Last 5 Years (1981-1986)	R&D Spending In Dollars Or As A % Of Revenue
Norsat International	1982	Public	60	• Consumer and Commercial Satellite Receiver Equipment	$11 Million	4%
Sinclair Radio Lab	1966	Private	6	• Sell and Distribute Antennaes and RF Filter Products	10% Annual Rate	-
Spilsbury Communications	1941	Private	65	• High Frequency Single SIde Band Radio • Digital Voice Products	15% Annual Rate	15%
Viscount Industries	1973	Private	32	• Building Entry Systems • Test Equipment • Portable Communications Centres • Custom Manufacturing	10% Annual Rate	10%
Wesgar Industries	1969	Private	25	• Sheet Metal Parts (Chassis, Panels, Frames, etc.)	20% Annual Rate	-

rapid growth period due to its state-of-the-art cellular technology and the international market acceptance of its product. NovAtel's labour force has grown from less than 100 people to 600 in Alberta within a four-year period since its formation.

All the Calgary firms, irrespective of size, report little synergy or linkage with other firms within and outside their industry. The two most frequent mentions as to the reason for this development are:

- There is no competition for the company's products. Although this is most common for small to medium-sized firms producing niche products, the two large firms have separate and distinct product lines.

- All companies would source raw materials from anywhere within Canada, or from imports. For the large firms, the immediate demand for specialized products probably outweighs the ability for these firms to wait for the development of a local supplier network. Because the Calgary telecommunications industry had no leading-edge firms until the establishment of Northern Telecom and NovAtel, the time span is probably insufficient to generate a core group of skilled elites that are able to branch out and become entrepreneurs.

The development of telecommunications manufacturing in Calgary thus far closely follows the trend of high-tech related industries in general, i.e. proprietary technology provides an efficient barrier to entry which allows small/medium firms to command premium prices for their products. There is a limited amount of technology transfer and, therefore, few inter-industry linkages which would, in turn, generate a critical mass. The pursuit of backward linkages by developing a strong local supplier network and the marketing of the city as a choice location are top priorities towards wider economic diversification provincially, which the NovAtel experience serves as a major, positive step.

e. Vancouver

A list of the companies surveyed and relevant corporate information is found in Table 5.5.

Vancouver firms demonstrate an ability to generate sales outside the region and the country. Two-thirds of all companies export their products. Ranges are from 5% to 90% of total sales. Of the ten exporting firms, seven receive at least 25% of their annual sales from that source. It is interesting to note that Microtel, virtually the only company which has not shown positive revenue growth in the last five years, is not one of the seven which depend highly on the export market. Total share of exports only accounts for 21% of annual revenue by concentration in its Spacetel product. One reason for the latter may be the company's reliance on manufacturing licenced products for GTE. This largest telecom manufacturer in the Vancouver area has finally reversed its downward revenue trend by securing a $268 million contract, with a Canadian National affiliate, to refurbish the Northern Warning System in 1988.

In terms of employment, all companies except Microtel have experienced significant growth in the past five years. Despite the reported rate of employment growth, 62.5% of the firms interviewed are in the small category having 1 to 49 employees. One-third are in the large category with 300 to 1,500 employees (Microtel). Although Microtel is B.C. Tel's manufacturing arm, it is not making the same positive impact that Northern Telecom, Bell Canada's manufacturing arm, is making in the other centres surveyed.

One major reason which is also linked to the comparatively low dependence on product exports is the three-year long corporate and product rationalization program at Microtel. Between 1984 and 1986, Microtel has relinquished the low margin telephone apparatus market. The research arm, Microtel Pacific Research, is concentrating on products with wider applications which include system control and surveillance equipment for gas and electric utilities. Since market acceptance of the new products will be key to employment generation, it is impossible to ascertain the employment generating potential of Microtel in the Vancouver area as the most dominant local telecommunications manufacturing employer at this time.

As a measure of indigeneous resourcefulness, a majority of the companies, particularly small firms, were established by residents of Vancouver. Since 40% of the firms were started before 1970 and another 33% during the 1970s by local entrepreneurs, Vancouver exhibits the features of an area with developed skilled resources. However, only 27% of the firms were started during the 1980s which indicates a slowing momentum for start-ups in the telecommunications manufacturing industry over the last twenty years. Therefore, there is some uncertainty as to the current stock of indigeneous resources and the amount of entrepreneurship in the region as compared to the earlier decades.

In summary, the contribution to regional economic development in the Vancouver area by the small to medium-sized firms are more apparent during the 1960s and 1970s. The slumping revenue and corporate restructuring of the largest firm - Microtel - has reduced the overall growth of the industry in recent years.

Twelve of the fifteen companies have forged linkages with other companies in Vancouver. Five of them, however, say their Vancouver business is very limited (many of these are large companies like Microtel, Glenayre, and Norsat, who do much of their sourcing from the Pacific Rim countries or the United States), while many companies report that, as the companies they did business with in Vancouver grew, so did they. One highly successful company, however, reports that its growth caused the companies it dealt with to grow. By increasing its demands, MDI fostered the development of its suppliers.

In terms of sales to telcos, nine of the fifteen companies sell to B.C. Tel, and eight sell to non-local telcos. Sales to the local telco run from 3% (Glenayre) to 40% (Microtel) of total sales. This points out the relative importance of the local service carrier in creating positive backward linkages in the region.

Overall, linkages in terms of inter-company sales of products are quite well established in Vancouver and synergy with the local telco is also an essential for close to 60% of the companies.

The fact that dominant firms reported only little to no regional sourcing of materials raises the question as to the time competitiveness and compatibility of Vancouver's telecom component suppliers in serving local telecom manufacturers. Thus, Vancouver has yet to achieve complete critical mass in the development of its telecommunications equipment manufacturing industry compared to cities such as Montreal and Ottawa.

5.2 The Majority of Carrier Equipment Purchases are from Domestic Suppliers and Stimulate Regional Development

In section 3.4 of this report, the close relationship between the telecommunications service carriers and the equipment manufacturers were identified. The telecommunications carriers in Canada typically purchase Canadian-made equipment and, thus, create the necessary backward linkages to foster the growth of the equipment suppliers. This section of the report shows the equipment demand pattern of the telecommunications firms and the impact of such purchases in ensuing growth of the equipment industry within Canada.

5.2.1 Telecommunications Equipment Demand in Canada: 1981 to 1984

The telecommunications carriers provide the principal market for the equipment suppliers in order to meet the service demands in transmitting voice, data and video information.

The analysis on telecom equipment demand draws on a report released by the Department of Communications in 1984 entitled "The Telecommunications Equipment Demand of the Canadian Telecommunications Carriers: 1981-1984". Equipment is broken down into four main categories - switching, transmission, station apparatus and outside plant.

The Canadian telecommunications carriers purchased $1.37 billion[1] worth of equipment in 1981, with the level of spending rising to $1.75 billion by 1984 (see Table 5.6). This represents an 8.5% average annual rate of growth. Canadian content also increased steadily, from 91% in 1981 to 95% in 1984. The composition of demand among the four types of equipment, based on total purchases over the same period, showed the following average shares:

- Switching Equipment = 26.4%
- Transmission Equipment = 24.7%
- Station Apparatus = 24.8%
- Outside Plant = 24.0%

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[1] All dollar figures and growth rates are based on current dollars as reported in the reference study.

TABLE 5.6

Telcommunications Equipment Demand By Region
1981 To 1984
($ millions)

	1981	1982	1983	1984	Average Annual % Change 1981 to 1984
Atlantic Canada	86.90	82.13	80.81	98.65	
% Change		-5.5	-1.6	22.1	4.3
Central Canada	787.20	842.00	849.50	881.80	
% Change		7.0	0.9	3.8	3.9
Western Canada	498.69	609.47	752.72	773.52	
% Change		22.2	23.5	2.8	15.8
Canada Total	1,373.00	1,533.00	1,683.00	1,754.00	

Source: Department of Communications, The Telecommunications Equipment Demand of the Canadian Telecommunication Carriers 1981-1984

a. Switching Equipment

Switching equipment demand rose substantially, registering a 13.3% annual growth rate from $331 million in 1981 to $481 million in 1984. Digital switching, in particular, was the fastest growing segment, rising from 52% of total switching equipment expenditure to 70% in 1984. Because of its cost effectiveness, the smaller carriers purchased digital switches to replace traditional equipment (such as analog-stored, program control, step-by-step and crossbar switches) which require costly maintenance. Canadian products captured 97% of the domestic switching market, while imports recorded about a 9% decline between 1981 and 1984.

b. Transmission Equipment

The demand for transmission equipment by the carrige industry has shifted towards digital technology, i.e., microwave and multiplexor systems. As a result, expenditures for digital plants increased from a 45% share of total transmission equipment spending to 58% by 1984. By contrast, analog transmission equipment expenditure remained largely unchanged. The fall in the relative share of analog equipment, however, was offset by the advances in digital products, recording a decline from 23.5% of transmission equipment expenditures to only 18% by 1984. Spending on the satellite sector rose in 1981, but tell each year between 1982 and 1984. Purchases of Canadian transmission equipment increased 40%, while imports dropped by 30% over the same period.

c. Station Apparatus

Demand for all station apparatus grew at an average annual rate of 5.5%, from $365 million in 1981 to about $430 million in 1984. Telephones averaged about 40% of the total annual investment in station apparatus, with an average annual spending growth rate of about 8% between 1981 and 1984. The second largest component of station apparatus is PBXs of 100 lines, with approximately 20% of the apparatus market and an average annual growth in demand of 5.3%. Canadian content in the dominant telephone and PBX categories is particularly high, at about 95%.

Branch equipment accounted for about 17% of this sector and achieved a 12% annual average growth rate. Data communications equipment, which accounted for 10% of this sector in 1981, declined at an average annual rate of 3.7%. Mobile and radio telephone equipment, combined, represents about 6% of this sector, with mobile/cellular phones achieving a 10% annual average rate of growth between 1981 and 1984. The remaining 7% of the station apparatus market is shared by teletypewriters and cathode ray display units, for which demand fell at a 4.4% average annual rate.

TABLE 5.7

Telecommunications Carriers[1]: Performance Indicators

	1971	1975	1980	1981	1982	1983	1984	1985
GDP (constant 1981 $ millions)	2,206.1	3,560.0	5,834.2	6,347.7	6,387.7	6,518.6	6,745.2	7,168.1
Annual avg. rate of Change (%)	-	12.7	10.4	8.8	0.6	2.0	3.5	6.3
Revenues (current $ millions)	1,822.7	3,120.3	6,287.6	7,480.2	8,401.1	9,138.3	9,959.7	10,672.9
(constant 1981 $ millions)[2]	4,105.2	5,262.0	7,009.6	7,480.2	7,441.2	7,602.6	7,980.5	8,229.0
Avg. annual rate of Change (%)	-	6.4	5.9	6.7	-0.5	2.2	5.0	3.1
Employment	80,296	45,783	113,923	116,299	111,636	106,449	102,415	99,793
% Change	-	4.5	3.5	2.1	-4.0	-4.2	-3.8	-2.6
Net Profits (current $ million)	245.1	446.3	707.4	753.6	755.3	917.7	1,022.0	1,108.6
% Change	-	16.2	9.6	6.5	0.2	21.5	11.4	8.5
Capital Investment								
• Plant (constant 1981 $ mill.)	719.1	866.7	1,066.4	1,013.1	912.8	640.2	642.8	678.9
Avg. annual rate of Change (%)	-	4.8	4.2	-5.0	-9.9	-30.0	0.4	5.6
• Maintenance and equipment (constant 1981 $ millions)	857.7	1,382.5	1,685.7	1,970.4	1,907.4	1,548.7	1,631.5	1,586.9
Avg. annual rate of Change (%)	-	12.7	4.0	16.9	-3.2	-18.8	5.3	-2.7
Revenues/Employee (constant $ 1981)	51,125.8	54,936.7	61,529.3	64,318.7	66,656.0	71,420.0	77,923.2	82,460.7
% Change	-	1.8	2.3	4.5	3.6	7.1	9.1	5.8

N/A - Not applicable due to availability of partial data for carriers.

[1] Telephone companies and telegraph, satellite carriers.

[2] Deflated by the Consumer Price Index for Services.

Source: Statistics Canada, Telephone Statistics, Cat. No. 56-203; Telecommunications Statistics, Cat. No. 56-201; The Consumer Price Index, Cat. No. 62-001; Gross Domestic Product by Industry, Cat. No. 15-512; and Department of Communications, Financial Statistics on Canadian Telecommunications Carriers, 1985.

d. Outside Plant

Within the outside plant equipment category, the most important is copper cable which accounted for three-quarters of the sector's new expenditure. The average annual growth rate was 4.2%. Underground cable is the second largest category, with 15% of the market and a 6% average annual growth in demand. Pole wires experienced moderate growth. The most rapid growth was in fibre optics, with purchases of $6.7 million in 1981, rising strongly to $22.7 million in 1984, a 238% increase. The share of the market for fibre optics also jumped from under 2% to 5.3%. Overall, the Canadian carriers buy more than 95% of outside plant material from Canadian manufacturers.

5.2.2 The Regional Dimension of Equipment Demand

The level of regional economic activity has generally governed the demand for telecommunications equipment. During the 1970s, the period of strong growth in demand for services in response to demographic trends, the growth in equipment supplied in this market increased at an annual average rate of 6.6%. In the second phase, the equipment market grew at an annual rate of 3.9%.

The health of the regional economies explains the variations in equipment demand during the latter period (see Table 5.7). With the comparatively slower economic recovery in the Atlantic Provinces, carriers have not made major expenditures to replace equipment. On the other hand, the healthy growth experienced by Central Canada over the previous period allowed carriers to pursue more aggressive modernization campaigns in order to improve the efficiency of their networks. Therefore, a stable growth in Central Canada purchases was maintained. The desire to increase capacity in Western Canada stimulated equipment demand as the telcos in the region pursued digital-based technologies, particularly in the early 1980s.

a. Atlantic Canada

In Atlantic Canada, the demand for telecommunications equipment by the carriage industry accounted for 5.5% of the country's total. The region has a high degree of Canadian content at 98%, with investment concentrated in station apparatus and outside plant equipment. Digital technology in the switching sector has not shown the same breakthrough in Atlantic Canada as in other regions of the country. A technological shift towards digital transmission occurred in the early 1980s, with digital transmission equipment investment rising from 37.7% to 72.2% of transmission investments.

b. Central Canada

Due to the recession in 1981-1982, growth of equipment demand in Central Canada (Quebec and Ontario) fell below the national average over the entire period of 1981-1984. The region is by far the largest purchaser of equipment, with over half of the Canadian total investment, and 90% of purchasing is from Canadian sources. The majority of spending is on transmission and switching equipment. Digital technology has taken hold in both the switching and transmission sectors. Copper is still the dominant material for outside plant equipment, despite the penetration made by fibre optics. Investments in telephones and PBXs have been firm throughout the survey period and are linked to demographic growth.

c. Western Canada

In the west (British Columbia, Prairie Provinces, Yukon and Northwest Territories) increases in equipment demand grew by 18% between 1981 and 1982, in anticipation of the need to increase network capacity. In 1984, it declined by 2.5% 1983 levels as the region's economy succumbed to the recession. The investment focus is on switching and transmission equipment to modernize the systems, with Canadian products making up about 95% of the purchases. Digital technology is also of growing importance in Western Canada. Although the station apparatus sector achieved relatively slower demand growth, investment in the mobile radios sub-sector is roughly four times greater than the national average. Fibre optics also made headway, particularly in Saskatchewan, increasing its share of outside plant investment from 4% in 1981 to 10% by 1984.

Overall, the historical development in Canadian telecommunications equipment demand has chiefly benefited from the long-term investment programs of the monopoly carriers. Short-term economic conditions have not played a major part in affecting equipment demand, other than the wide-scale network technology changes in the mid-1970s from analog to digital. The situation by the 1981-1982 recession has been altered when the general health of domestic and international economies affected equipment demand. The growing competitiveness of the world's telecommunications service as well as the equipment manufacturing industry has increased the significance of short-term economic conditions on equipment sales growth.

5.3 Growth of the Equipment Manufacturing Sector Relies Heavily on Sales to Canadian Telcos and Exports

Although in Sections 3.4 and 5.4, the preferences for Canadian equipment of the major carriers were considered a key stimulant for growth in the Canadian telecommunications manufacturings sector, the regional and corporate concentration of this growth is far from diversified regionally. This section of the report identifies the regional dimension of equipment manufacturing, the structure of the industry in terms of corporate concentration and divergent product lines between the large and small manufacturers.

5.3.1 Canadian Telecommunications Manufacturing Industry Size and Location

a. Telecommunications Equipment Industry (SIC 3351)

As of 1984, there were 49 telecommunications equipment manufacturing establishments classified within Standard Industrial Classification (SIC) 3351.

TABLE 5.8

Provincial Distribution of Telecommunications Equipment and Related Manufacturers, 1984 (SIC 3335)

	Newfoundland	P.E.I.	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon & N.W.T.	Canadian Total
Telecommunications Equipment												
SIC 3351: Telecommunication Equipment Industry												
No. of Plants	1	1	1	1	10	19	4	2	6	4	0	49
Electronic Parts And Other Components												
SIC 3352: Electronic Parts & Components												
No. of Plants	0	0	4	2	37	142	5	2	2	14	0	208
SIC 3359: Other Communication and Electronics Equipment												
No. of Plants	0	0	6	0	53	115	4	3	8	30	0	219
Total Plants	1	1	11	3	100	276	13	7	16	48	0	476
% of Total	0.2	0.2	2.3	0.6	21.0	58.0	2.7	1.5	3.4	10.1	0.0	100.0

Source: Statistics Canada, Communications & Other Electronic Equipment Industries, Cat. No. 43-206

These companies manufacture equipment used to transmit information in voice, data or video form. Their major products include radio transmission equipment, multiplex equipment, central office and subscriber switches, cable - both metallic and fibre-optic - and subscriber apparatus.

Vertical integration was seen to be essential by the industry to achieve the critical mass required for research and economies of scale in manufacturing. More importantly, the largest companies - NTL and Microtel - benefited from market information from their parent service companies as primary suppliers to Canada's two largest telcos. In recent years, a number of middle range and smaller firms have emerged in particular sub-sectors of the industry. These companies include: Mitel, Gandalf and Norpak, manufacturers of advanced switching and related equipment; Spar Aerospace and Canadian Marconi in satellite and defense-related communications equipment; Canada Wire and Cable and Phillips Cable serving the transmission area; NovAtel in supplying cellular phones; and large foreign companies AT&T, ITT, Plessy, NEC etc., which manufacture, assemble or import particular product lines for sale in Canada.

In terms of the regional dimension, Table 5.8 shows that most of the manufacturing plants are located in Central Canada, 39% in Ontario and 20% in Quebec. The four Western Provinces have about one-third of the total. Through its corporate policy to supply equipment to individual telcos, and the indirect corporate relationship through Bell Canada Enterprises, only Northern Telecom has one plant in each of the Atlantic provinces. No plants in this category are located in either the Northwest Territories or the Yukon. Ontario alone accounted for 58.2% of industry shipments in 1982 (based on the 1980 SIC), a share which slipped to 56.9% by 1984 (Table 5.9). Although the data set is incomplete for other provinces, the increasing share gain by Alberta, between 1982 and 1983, from 5.4% to 6.3% of industry shipments indicates the west is gaining strength.

The direction of the shift regionally is not measurable due to an incomprehensive provincial data base. Moreover, 90% of the sector's total R&D spending is located in Central Canada because of the presence of BNR and NTL which, as one entity, accounted for 80% of the total Canadian telecommunications R&D spending in 1985.

The genesis of the sector and its high level of concentration in a small number of areas in Canada is more fully explored in Work Module 5 of this study. Some of the key reasons for the regional aspects of the industry are summarized as follows:

- A longer history of industrial development in Central Canada which spawned an indigenous base of scientific expertise and financial backing to sustain long-term expansion.

- Spin-offs resulting from the telecommunications research efforts in and around Ottawa by both the federal government and BNR which helped to create skilled entrepreneurs.

- Medium to small-sized companies are more likely to have a local orientation during start-up because of established industry and business contacts.

- Commercialized academic research and regional diversification policies which can be said to have assisted in the establishment of telecommunications manufacturing in Saskatoon and Calgary, although in absolute terms, these two cities have rather small facilities relative to those in Central Canada.

- In Vancouver, the momentum of growth for small to medium-sized firms has slowed significantly in the 1980's, while the largest company - Microtel - has been rationalizing its product line and employment. Moreover, the sourcing of material from the Pacific Rim also points out the lack of a critical mass stage of development compared to the situation in Montreal and Ottawa.

One of the major developments in the industry in recent years has been its increasing export orientation. This is particularly important for the large and medium-sized firms which are limited in their growth potential by a small domestic market.

By entering the highly competitive international market, Canadian telecommunications equipment manufacturers have to face the challenges of Japan, the United States and Western European manufacturers. According to the 1984 Department Of Communications report on the "Supply of Communications Equipment in Canada", the worldwide telecommunications market was $40.2 billion in 1980. This has increased to an estimated $65 billion in 1986. However, only one Canadian company has been able to rank in the global market - Northern Telecom - with an estimated 8.1% of the 1986 world market, increasing from less than 4% in 1980. Thus far, only the United States is open to all international equipment suppliers. Countries such as France, the United Kingdom and Japan have only recently relaxed their government procurement practices through de-regulation and privatization of their national telcos.

One of the biggest obstacles, aside from international trade politics, is that North American telecommunications manufacturers have different equipment standards than systems elsewhere in the world. Nortel reportedly has spent $100 million to ensure that its products are certified in Europe. Such large front-end entry costs and product development expenses continue to act as impediments for medium to small-sized Canadian manufacturers to participate in the world market on any significant scale.

b. Electronic Parts and Other Components (SIC 3352, 3359)

These two sub-groups accounted for a total of 427 plants in 1984 (Table 5.8). In general, these plants serve large communications and computer companies which produce components for in-house use. There is also a merchant sub-sector of smaller firms which produce commodity items mostly with a niche market orientation. Their products include printed circuit boards,

TABLE 5.9

Communications Equipment Manufacturers Value Of Shipments By Province
Thousand Of Dollars

1970 S.I.C. 335		NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA	B.C.	YUKON & N.W.T.	CANADA
1971		-	-	X	X	181,967	426,911	1,713	X	7,381	24,512	-	660,190
1972		-	-	19,413	X	211,508	483,215	3,715	X	8,782	22,422	-	755,763
1973		-	-	21,347	X	184,893	615,863	6,317	X	11,038	39,117	-	888,984
1974		-	-	22,906	X	320,642	800,830	12,005	X	13,497	41,941	-	1,225,422
1975		-	-	21,777	X	397,190	826,362	13,679	X	40,271	52,742	-	1,368,086
1976		-	-	X	X	387,290	862,374	11,255	X	30,221	53,884	-	1,383,162
1977		-	-	X	X	377,113	932,527	10,381	X	38,466	43,805	-	1,441,330
1978		X	X	31,281	X	410,268	986,058	12,790	X	27,721	45,477	-	1,532,406
1979		X	X	29,617	X	486,408	1,148,394	40,061	X	27,703	54,842	-	1,813,826
1980		X	X	34,436	X	676,648	1,426,055	54,454	X	41,093	64,972	-	2,328,935
1981		X	X	32,150	X	761,528	1,711,814	70,298	X	86,985	80,804	-	2,786,459
1982		X	X	24,531	X	884,261	1,819,227	X	X	92,432	91,031	-	3,055,291
1980 S.I.C.*													
1982	3351	X	X	X	X	X	957,256	X	X	89,362	X	-	1,644,619
	3352	-	-	X	X	X	300,713	X	X	X	X	-	391,554
	3359	-	-	X	-	438,133	557,744	X	X	X	17,462	-	1,027,779
		X	X	X	X	438,133	1,815,713	X	X	89,362	17,462	-	3,063,952
1983	3351	X	X	X	X	X	842,454	X	X	97,337	X	-	1,540,119
	3352	-	-	X	X	93,597	333,900	X	X	972	4,920	-	447,341
	3359	-	-	15,522	-	471,297	636,341	X	X	706	12,788	-	1,137,955
		X	X	15,522	X	564,894	1,812,695	X	X	99,015	17,708	-	3,125,415
1984	3351	X	X	X	X	X	1,033,856	X	X	X	X	-	1,817,205
	3352	X	X	X	X	X	343,370	X	X	X	X	-	610,429
	3359	X	X	13,741	X	565,560	784,510	X	X	3,944	22,773	-	1,393,917
		X	X	13,741	X	565,560	2,161,736	X	X	3,944	22,773	-	3,820,551

X Secured to meet secrecy requirements of the Statistics Act.

* Standard Industrial Classification: 3351 - Telecommunications Equipment, 3352 - Electronic Parts and Components, and 3359 - Other Communication and Electronic Equipment.

Source: Statistics Canada, Communications Equipment Manufacturers, Cat. No. 43-206 Annual, 1971 to 1982 and Communications and Other Electronic Equipment Industries, Cat. No. 43-206 Annual, 1983 and 1984.

micro-electronic components, satellite parts and components, search station components, semi-conductors, transformers, passive components and connectors.

The key development in these two sub-groups of the telecommunications equipment industry has been its rapid growth. In just the three years (1982-1984) when Statistics Canada reported financial and employment data for these two sub-groups, their combined share of the value of shipments increased from 46.3% in 1982 to 52.4% of the entire industry category (Table 5.9). Moreover, their share of the total industry employment also increased from 55.2% to 58.2% by 1984. One explanation for this growth is in the smaller firm's technological skill in finding market niches, and bringing new products to market quickly in order to exploit those niches at premium prices. While the large firms emphasize basic research to achieve major technological break-throughs, some of the key individuals involved in the process left to become entrepreneurs and establish firms dedicated to exploiting the new technology.

On a regional basis, most of the 427 plants are concentrated in Ontario and Quebec, with 256 and 90 of all plants in Canada, respectively. British Columbia accounts for 43 of the plants. The Prairie Provinces have 24 plants, and twelve are located in Nova Scotia and New Brunswick. There are no manufacturing plants in Prince Edward Island, Newfoundland, or in the Yukon and Northwest Territories.

The concentration in Ontario of industry shipments for these two equipment manufacturing sub-sectors fell from 60.5% in 1982 to 56.3% in 1984. Again, a comprehensive analysis as to the direction of this gradual shift in telecom component manufacturing away from Ontario is precluded with insufficient data.

Available data, however, also suggest that the Ontario share of employment in these two sub-groups has declined slightly, from 63.2% in 1982 to 61.2% in 1984. The net gains achieved on a regional diversification basis, away from Central Canada, are encouraging, but their direction is again not measurable due to lack of data at the provincial level.

In terms of regional development, small technology firms play a significant role in generating self-sustaining, long-term growth in the regions where such activities are present. A strategy to stimulate local initiatives could help to reduce the problems of dependence and instability caused by the larger and more footloose firms. Although the value of fostering the growth in small technology firms is undeniable, the survival of these firms in order to bring about job and wealth creation in the region needs to be addressed. One of the findings in the case study is that the newly developed industry pockets in the Western Provinces do not indicate a high degree of local synergy since the niche markets served and lack of technological exchange with larger firms act as restraining factors.

c. Ownership and Structure of Equipment Manufacturers

Four companies accounted for 80% of the domestic telecommunications manufacturing market in 1984. The companies and their domestic market shares are:

Northern Telecom:	65%
AEL Microtel:	10%
Mitel:	3%
Spar Aerospace:	2%

The remaining 20% of the market consists of medium and small-sized firms, supplying components and sub-assemblies to the major firms.

Until 1986, most of these major manufacturers were Canadian-owned. Only AEL Microtel, as a subsidiary of B.C. Telephone, is majority-owned by a foreign firm, GTE of the United States. In 1986, however, Mitel was acquired by British Telecom, leaving Nortel and Spar Aerospace as the largest Canadian-owned major telecommunications equipment manufacturers.

According to a 1982 Department of Communications survey, foreign ownership is most prevalent in the medium-sized manufacturers, which employ fewer than 100 people and have sales of less than $50 million. In the small-sized firms, the presence of foreign firms is much less pronounced than among medium-sized ones. The Department of Communications identified about 50% of medium-sized manufacturers as being foreign-owned, but only 14% of the small manufacturers are subsidiaries of foreign firms.

Northern Telecom, Mitel and, to a lesser extent, Microtel (since it is still essentially a domestically oriented supplier with only 20% of annual revenue derived from exports), operate on a scale which compares well with their respective worldwide competition. Each has in-house integrated circuit (IC) design facilities representing access to the major cost reduction technology available to the electronics industry. Northern and Mitel are further integrated with in-house IC production capability. In addition to cost control, the IC design capability enables these suppliers to rapidly move a new design to production with the speed necessary to compete in the marketplace, which is a key strategic factor in this industry.

The stable domestic market environment, as a result of the relationship with the domestic telecommunications carriers and the advanced nature of the Canadian market, has been of significant benefit to the development of the Canadian telecommunications supply structure. The association with the operating companies also provides financial strength that is increasingly necessary to pay for growing investments in product development and to convince potential customers of the credibility of the Canadian suppliers.

Although reputable and internationally competitive at what it does, the Canadian industry's capabilities are relatively shallow. Northern Telecom is a full-line supplier; every other supplier specializes in one or more smaller aspects of telecommunications products.

5.4 R&D is Sustained by Government Support

This section of the report examines the trend in research and development (R&D) required to sustain the growth in the Canadian telecommunications manufacturing industry and the importance of government R&D incentives. It identifies the vital importance of technological advancements, the different level of expenditures and R&D commitment amongst firms, the availability of government R&D incentives, and the level of dependence on these incentives by manufacturers of telecommunications equipment.

5.4.1 The Technological Factors

As the convergence of the telecommunications and high-tech industries becomes permanent, new design concepts leading to commercialized products are being introduced at an accelerated pace. In order to succeed in a rapidly changing and competitive marketplace, the pace of technological diffusion has increased and effectively shortened the commercial shelf-life of any particular breakthrough.

In the absence of a large domestic market, technology is the principal determinant of the competitiveness of Canada's telecommunications industry. Large Canadian suppliers such as Nortel, Mitel, Gandalf, etc. are on a par with international competition in the use of very large-scale integrated circuit (VLSI) techniques, and have a competitive edge in the digital switching and packet switching areas. Canada is also well advanced in the use of satellites and fibre optics for transmission purposes, and the leading firms are increasing their strengths in the application of technology to the automation of their own production. Smaller firms and skilled entrepreneurs have also furthered the innovative cause in developing technology with commercial potential specifically addressing niche markets.

This level of technological advance was acquired only through intensive front-end R&D investments which sometimes account for 10% to 11% of annual sales and sometimes exceeding a firm's capital expenditure. To confirm this technological trend, the Nortel strategy in maintaining a leadership role in telecommunications equipment manufacturing is of note.

Other than the beneficial spin-offs in terms of market information sharing and product sales through its vertical integration with Bell Canada previously discussed, there are three main corporate strategies:

- Massive investments in R&D including integrated circuit design in-house which ultimately creates a competitive edge over the companies relying only on circuits available on the market. Through a vertically integrated components supply chain, timely product launches are maximized and product prices can be lowered, while the competitors needing to purchase from other circuit manufacturers do not enjoy such advantages.

- To create products with an "open" architecture which are compatible with a wide range of office automation equipment and reduce the risks of obsolesence as product life cycles are now much shorter.

- Concentrate on sales abroad as the relatively small size of the domestic market cannot absorb the high front-end cost of technological innovation to introduce successive generations of leading edge products. To this end, total revenue from Canadian customers only accounted for 29.9% of Nortel's gross revenue in 1986 - 65.2% came from sales in the United States, and the remaining 4.9% from sales internationally.

5.4.2 Telecommunications Manufacturing R&D Expenditure

R&D expenditures by the Canadian telecommunications equipment manufacturers (excluding electronic parts and components) is the largest of all Canadian industrial R&D spending in the three main industry sectors - mining and oil, manufacturing, and services. Final figures for 1985 indicate that telecommunications R&D accounts for 25.8% of total manufacturing sector R&D and 19.5% of R&D spending by all Canadian industries.

At the company level, it is not surprising that the telecommunications manufacturing leader - Nortel - accounted for over 80% of the industry's R&D in 1985. Its capital commitment to R&D rose from $29.7 million (current dollars) in 1971, or 8.6% of Canada's total industrial R&D that year, to $586.3 million in 1985, or 17.6% of the nation's total industrial R&D spending.

In the international perspective, Canadian telecommunications manufacturing R&D spending is far behind (at least in current dollar terms) the recognized world leader in the field, the United States. American telecommunications manufacturers spent a total of U.S. $4.4 billion in 1985, or 11 times the amount Canadians spent on an equivalent currency basis. Considering the different size of the two countries' population, however, the approximately ten-times larger American market implies the two countries are not far off in telecommunications R&D intensity on a per capita basis.

5.4.3 Government R&D Incentives and Their Importance for Canadian Telecommunications Manufacturers

The federal and some provincial governments have been active in supporting the growth of the telecommunications manufacturing industry. The level of support varies from tax incentives to grants, loans, and contract-out policies (such as in satellite and defence communications). Job training programs to enhance skills development is covered by the New Technology Employment Program (NTEP) and the National Industrial Training Program (NITP). Various provincial governments have similar programs of matching grants, loans, trade assistance and skills development and upgrading in addition to the federal incentives.

One of the most mentioned items during the survey of telecom manufacturers is the federal Investment Tax Credit. The federal government introduced the credit beginning April 1, 1977 which allowed a certain percentage of those expenditures on R&D for which the firm could claim tax exemption. Following some changes, the credits could be calculated at 7% to 35% of eligible expenditures, depending on the location of the R&D and size of the firm beginning February 27, 1986. The objective is to allow the flexible rate of the tax credit to encourage economic activity in regions where it is most needed. Unfortunately, public statistics do not reveal the amount claimed by the telecommunications industry. From our survey, however, firms of all sizes are not only aware of the existence, but reportedly claim the credit consistently as a means to defray R&D costs.

In general, the larger firms are more reliant on the tax credits and Export Development Corporations' financial assistance in bidding for major international projects. The medium to small-sized companies are more likely to apply for funding through IRAP (Industrial Research Assistance Program), IRDP (Industrial Regional Development Program) and PEMD (Program for Export Market Development). Federal government funding for telecommunications R&D reached $8 million, or 1.2% of total industrial R&D spending from all sources of funding in 1985.

Overall, government assistance is vital not only to sustain front-end R&D but as basic capital for the fledgling small to medium-sized telecommunications companies. Larger companies with access to internally generated funds and the equity market for investment needs rarely require direct government funding assistance. For example, Nortel reported that the company did not receive one cent from direct government funding since the various grants and loans were introduced. Rather, it was the investment tax credit which provided the company with about 16% to 24% relief from its total federal tax liability in the 1982 to 1986 period.

5.5 R&D and Manufacturing Gravitates to Established Centres

As a result of the technology-driven nature of telecommunications manufacturing, the regional bias towards a Central Canadian concentration of manufacturing activities is also associated with a concentration of R&D activities.

Statistics on industry-specific R&D expenditures, by province, available beginning in 1981, are limited to Quebec and Ontario, and indicate that these two provinces consistently account for over 90% of R&D spending in the telecommunications manufacturing sector. More importantly, Ontario alone accounts for about 80% (83% in 1985) of the industry's total. The presence of federal government-sponsored R&D activities in the national capital region is reflected in the region's telecommunications R&D expenditures. This figure also includes the presence of Canada's largest single industrial R&D enterprise, Bell Northern Research, located in Ottawa. Quebec accounted for 8.6% of the industry's R&D spending in 1984 (no figure released for 1985 as the aircraft and parts industry's R&D predominates in that province.

The telecommunications manufacturing industry also accounts for the highest percentage of R&D personnel employed across all industry segments. Telecom manufacturing R&D personnel reached 6,425 in 1985 and accounted for 16.1% of Canadian industrial R&D personnel. This figure is also 63.9% higher than the second most important category of R&D personnel, i.e., the aircraft and parts industry. Ontario alone accounted for 83.7% of the telecom manufacturing industry's total R&D employees in 1985 with 5,380 persons located in the province.

The presence of federal government research laboratories as well as Bell Northern Research obviously helped Ontario to its dominance in telecommunications R&D and manufacturing. This biased statistic should be viewed in its historical perspective. The genesis of the Ottawa high-tech industry dates back to the government research of the Defence Department and National Research Council during, and immediately after, World War 2. This created spin-offs such as Computing Devices of Canada (now part of Control Data Corporation), Leigh Instruments Ltd., and the establishment of Northern Electric's Labs (later named Bell Northern Research).

These pioneering firms were later joined by Northern Telecom's Advanced Devices Centre producing semi-conductors, and was turned into a separate company Microsystems International Ltd. (MIL) to produce microchips in 1969. MIL received about $37 million in government loans and grants between 1969 and 1975 when the company folded with $50 million in losses. The jobless scientists from this venture can be traced to be the start-up entrepreneurs behind some 30 small high-tech firms in Ottawa, according to the Ottawa Carleton Economic Development Corporation's survey in 1986. One of these former MIL employees established Mitel in 1973 and actually reached prominence internationally by 1979 competing with Nortel for recognition.

This brief historical review shows a thirty-year process for Ottawa to become a high-tech/telecommunications centre in Canada. In the remaining four urban centres surveyed, only Montreal can offer the same scope in indigeneous skilled resources, entrepreneurship, capital base, linkages across related industries and, most important, history, to reach a critical mass stage of development necessary in the telecommunications manufacturing industry to generate genuine economic benefits regionally.

In addition to this history of development by private and public enterprises, substantial support is provided through the academic institutions and industry-sponsored centres of excellence to pursue telecommunications expertise. For example:

- Ontario has the University of Toronto Microelectronics Centre; Ontario Centre for Advanced Manufacturing, Waterloo Innovation Centre, Waterloo Micro-Systems and, as of spring 1987, the Telecommunications Research Institute of Ontario (T.R.I.O.) in Ottawa (a jointly funded program between the University of Ottawa, industry, and the provincial government) and the Communications Research Laboratories at McMaster University which is associated with T.R.I.O.

- In Saskatoon, the Innovation Place Research Park, the Advance Technology Training Centre and the University of Saskatchewan focus on the technology front.
- In Alberta, the Alberta Telecommunications Research Centre was established in April 1986 in Edmonton. The Centre is formed between the University of Alberta, Bell Northern Research and the provincial government to sustain telecommunications research expertise following BNR's departure from the Edmonton Research Park in 1985.
- In British Columbia, the Microelectronics Centre of Excellence and Discovery Foundation seeks to establish science parks near academic institutions in the province.
- Quebec was a recent entry through the public utility board's request for Quebec Tel to establish a $10 million R&D fund in 1986. At present, Laval University's laser research program is the first beneficiary.

All these ventures are necessary support systems for the development of local scientific expertise. As the Ottawa experience points out, most of the centres of excellence are still in their infancy compared to the National Research Council, the Communications Research Centre, and BNR. Therefore, the full benefit to enhance regional economic development through telecommunications manufacturing in areas outside of Ontario will not easily be a near-term reality.

5.6 Assessment

The two sub-sectors of the telecommunications industry - telecommunications carriers and equipment manufacturers - are contributing to regional economic development through both the expansion within the industry and the provision of services required by Canadian businesses.

The telecommunications service companies are generally major employers in the various provinces. Their capital spending plans within the region as well as purchases of equipment in the province or Canada are chief contributors to regional development. Moreover, Canadian telecommunications services are competitive in both the pricing structure and technology for customers across the country which establishes the vital link for communications users everywhere. The provision of services in itself is not a sufficient condition to stimulate regional economic development by attracting business investment into the region. Factors such as natural resource endowment, the industrial base and population concentration are more essential, and these factors tends to vary regionally.

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Telecommunication manufacturers have directly benefited from the purchasing patterns of domestic carriers and the export potential, particularly in the recently deregulated Untied States' telecommunications market. The gains in telecommunications manufacturing, however, have been costly in terms of front-end R&D spending and the lion's share of the gains are still the domain of a few large Canadian firms. The pattern of development regionally is also highly uneven. Central Canada dominates in both R&D and manufacturing activities through the presence of federal government sponsored research and the long period of historical development for the industry in the region. Although economic diversification plans have stimulated the growth of pockets of telecommunications manufacturing in peripheral regions of Canada, to achieve the critical mass stage of self-sustained regional development comparable to the Central Canadian experience would require consistent government R&D assistance and contracting-out policies.

6.0 CONCLUSIONS

This report has reviewed the economic factors influencing the growth and development of Canada's telecommunications industry over the period 1971 to 1985. It has assessed the importance of telecommunications to business users, as well as the regional economic development dimensions of both industry growth and its contribution as infrastructure support. This section draws together the primary conclusions on telecommunications and regional economic development based on this analysis.

6.1 The Structural Shift in the Canadian Economy from Goods to Services Will Continue to Drive the Growth of the Telecommunications Industry

The fundamental evolution of the structure of the Canadian economy observed over the study period is expected to continue as the services sector maintains its dominant role. The shift from goods to services production in the economy was accompanied by strong growth in the telecommunications industry. While growth within this sector was stronger in telecommunications services, performance of the telecommunications equipment manufacturing sub-sector also exceeded most goods-producing sectors.

Performance of the telecommunications services sub-sector will continue to track that of overall service sector growth due to its high dependence on telecommunications. Financial institutions, insurance and real estate are increasing their use of telecommunications due, particularly, to the national nature of their operations and the vital importance of timely information availability.

While this augurs well for the services sub-sector, prospects for the equipment industry will be influenced by these and other factors. Canada is a major exporter of telecommunications equipment and also represents an important market for offshore manufacturers. Retention of key markets, both domestic and offshore, through innovation and cost-competitiveness will be critical to the continued growth of this sub-sector.

The industry has developed a broad range of telecommunications equipment to meet domestic needs as well as to allow companies to dominate niches in several foreign markets.

The bilateral trade agreement will provide assured access to the United States' markets for telecommunications manufacturers but will also increase competition from U.S. suppliers in the Canadian market. At the same time, enhanced trade is expected to stimulate the telecommunications service sector as business interaction between Canada and the United States is increased over the next decade. Demand for interconnect telecommunications equipment and its servicing is expected to increase, particularly in Canada's manufacturing sector as it moves to improve its competitiveness. Many U.S. firms are well-positioned to move into the Canadian marketplace, increasing competition and putting downward pressure on prices. This will benefit users, but not the Canadian industry providing these products and services.

6.2 Business Users Have Varying Telecommunications Needs

The analysis of the needs of business users has shown both commonality and variation among their requirements depending upon size, sector and location of the operation. Large business users desire the latest innovations in telecommunications to improve information and data flow and reduce costs. Factors important to their needs are service availability, high quality telecommunications, and uniformity of regulation and costs on a nation-wide basis.

Smaller businesses, which are considered the backbone of the Canadian economy, are more regionally dispersed and often operate in smaller geographical markets. As a result, they have less complex telecommunications requirements than their larger counterparts. Nonetheless, telecommunications advances and availability are important to the profitability, productivity and geographic market expansion of both large and small businesses.

While telecommunications did not emerge as a critical factor in location decision-making due to the relatively greater importance of other factors, the quality of telecommunications services affects the choice of some regions for business activities. Some areas may be disadvantaged due to the unavailability and/or price of services.

Greater uniformity of regulations and cost structures of telecommunications services is perceived as important to improving the cost-competitiveness of Canadian business, and could enhance business prospects in global markets.

6.3 Investment to Improve Services Outside Major Urban Centres is Required to Support Regional Economic Development

The geographic disparities which emerge in telecommunications are not concentrated within large geographic areas, with the exception of the North. While most telecommunications services are available in regions where economic activity is concentrated, two key concerns are apparent:

- Service availability and prices vary between major centres and other areas; and
- Service quality also varies on a geographical basis.

The lack of services in certain areas denies businesses access to services which are readily available to businesses located in major centres due to the greater degree of competition in some services. Data communications, which is growing rapidly and becoming a prerequisite to effective business operations, is a case in point. Apart from hampering the development of businesses already located in these regions, service unavailability disadvantages some areas as a locational choice for new or expanding businesses. The urban/rural gap can be expected to remain as competition focuses on major markets which have a concentration of customers.

Service quality has been shown to vary across regions. Many business users perceive that increased competition would stimulate service improvements in response to customer demand.

Telcos can make some improvements through capital investment in areas outside major centres. The plans of Canadian telcos which call for upgrading of systems in rural areas should reduce some of these disparities. The gap will, however, likely remain, as competition and demands from larger users in high traffic corridors continue to exert pressures on telcos to invest in new technologies, and investments outside these urban areas do not prove to be as cost-effective.

6.4 Summary

Telecommunications is critical to the successful operation of Canadian business, particularly as an infrastructure support. Growth of Canada's service sector will continue to stimulate growth of the telecommunications industry, although productivity gains facilitated through new technology and economies of scale will limit the regional economic contribution of telco employment growth. Telco preference for Canadian suppliers should provide demand to stimulate growth of the telecommunications equipment industry which has established itself in regionally-important high-tech centres. Free trade could enhance export opportunities through more assured access to the United States, which is Canada's most important export market. Increased opportunities for United States product entry into Canada could increase competition which would be beneficial to users, but may have differing effects on equipment manufacturers depending on their continued strength in their established niche markets.

Planned investments by telcos in equipment and service improvements outside major centres should begin to improve availability and quality of services in these areas, but lags will continue to exist as investment is also required in high-demand corridors to meet user requirements. The result is potentially some narrowing of telecommunications services among regions, but not a complete elimination of these disparities. Existing businesses are, however, often located in these areas for reasons other than telecommunications services, but will benefit from these improvements. However, the level and quality of services in certain regions outside major centres may continue to be disadvantaged as a locational choice, since telecommunications has been demonstrated to be a necessary although not sufficient condition for economic development.

APPENDIX I

LIST OF MEMBERS OF THE STEERING COMMITTEE

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Mr. R. Simpson (Co-Chairman)
Mr. E. King
Ms. D. Mozes
M. Lajeunesse
Federal Department of Communications

Mr. J. Dawson
Ms. R. Kabalin
Government of Alberta

Ms. F. Baskerville
Government of British Columbia

Mr. C. Feaver (Co-Chairman)
Government of Manitoba

Mr. C. Bourgeois
Government of New Brunswick

Mr. N. Pottle
Government of Newfoundland

Mr. J. Quirke
Government of Northwest Territories

Ms. K. Peart
Government of Nova Scotia

Mr. M. Stevens
Government of Ontario

Mr. J. Kane
Government of Prince Edward Island

Mr. G. Julien
Government of Quebec

Mr. K. Wrigley
Government of Saskatchewan

Mr. R. Robbins
Government of Yukon Territory

SECTION C: LONG DISTANCE TELEPHONE SERVICES

Please answer the following questions for your specific location. The next few questions deal with your organization's use of long distance telephone services for both voice and data.

4. How important are long distance telephone services to the success of your organization at this location? **READ SCALE.**

	Very important	1
	Somewhat important	2
	Not very important	3
	Not at all important	4
DO NOT READ →	Don't know	8

5. Approximately, what percentage of the long distance calls are made from this location to other locations ... **READ WHOLE LIST. REPEAT LIST ONE AT A TIME. IF RESPONDENT HESITATES, ASK FOR HIS/HER BEST GUESS. MAKE SURE TOTAL EQUALS 100%.**

	%	Don't know	
(FOR QUEBEC AND ONTARIO ONLY) within your area code	___	888	24-26
Elsewhere in your province or territory	___	888	27
Elsewhere in Canada	___	888	30-32
In the U.S.	___	888	33
Overseas	___	888	36
TOTAL	100%		

APPENDIX II

BUSINESS USER SURVEY
QUESTIONNAIRE

The Coopers & Lybrand Consulting Group
55 Metcalfe Street, 12th Floor
Ottawa, Ontario
K1P 6L5
(613) 237-3702

FOR OFFICE USE ONLY

Card No.:	1	1
Resp. No.:	___	2-4
Project No.:	44603449	5-12

TELECOMMUNICATIONS SURVEY

SECTION A: INTRODUCTION

Good morning/afternoon. May I please speak to the person in your office responsible for your telephone service. **ONCE YOU HAVE RIGHT PERSON: RE-INTRODUCE YOURSELF IF NECESSARY.** Hello, my name is _______________ from The Coopers & Lybrand Consulting Group. We're conducting a survey for the federal and provincial/territorial governments. The objective of the study is to assess the importance and impact of telephone services on regional development. Your organization has been randomly selected to voluntarily participate in this survey. A summary of the survey results will be provided to respondents. All responses to the survey will be strictly confidential.

SECTION B: SCOPE AND ORGANIZATION

1. First, could you tell me if you work in the Canadian head office of your organization?

Yes	1	→ SKIP TO QUESTION 3
No	2	

2. Where is your Canadian head office located? 14-15

City ______________________ Province ______________________ 16-

3. Does your organization have other business locations ... READ LIST. CIRCLE ONE NUMBER ON EACH LINE.

	Yes	No
In the same city	1	2
Elsewhere in the same province or territory	1	2
Elsewhere in Canada	1	2
In the U.S.	1	2
Overseas	1	2

18 19

SECTION D: COMPUTERIZATION AND DATA COMMUNICATIONS

6. Does your organization at this location use computers ?

Yes 1
No 2 → SKIP TO SECTION E — 39
Don't know 8

7. Does your organization, at this location, use any of the following types of computers? **READ LIST.**

	Yes	No	Don't Know	
Personal computer/P.C.'s	1	2	8	— 40
Minicomputers	1	2	8	— 41
Mainframe	1	2	8	— 42

INTERVIEWER: ASK QUESTIONS 8 AND 9 SIMULTANEOUSLY FOR EACH ITEM.

8. Does your organization at this location use computers for ... **READ ITEM. CIRCLE BELOW UNDER QUESTION 8.**

9. **ASK ONLY IF "YES" IN QUESTION 8.** How important is computerization in this area? Is it ... **READ SCALE. RECORD BELOW UNDER QUESTION 9.**

	QUESTION 8			QUESTION 9					
	Yes	No	Don't know	Very important	Somewhat important	Not very important	Not at all important	DO NOT READ Don't know	
Administration	1	2	8	1	2	3	4	8	43-4
Accounting	1	2	8	1	2	3	4	8	45-4
Production/operations	1	2	8	1	2	3	4	8	47-4
Sales	1	2	8	1	2	3	4	8	49-5
Research	1	2	8	1	2	3	4	8	51-5
Inventory management	1	2	8	1	2	3	4	8	53-5

10. Does your organization use data communication services; that is, receive or send information to or from computers at other locations?

Yes 1
No 2 → SKIP TO QUESTION 20 — 5
Don't know 8 → SKIP TO SECTION E

[redacted]WER: ASK QUESTIONS 11 AND 12 SIMULTANEOUSLY FOR EACH ITEM.

11. Does your organization use data communications for ... **READ ITEM. CIRCLE BELOW UNDER QUESTION 11.**

12. **ASK ONLY IF "YES" IN QUESTION 11.** How important is data communications in this area? Is it ... **READ SCALE. RECORD BELOW UNDER QUESTION 12.**

	QUESTION 11				QUESTION 12					
	Yes	No	D.K.	N.A.	Very important	Somewhat important	Not very important	Not at all important	DO NOT READ Don't know	
Administration	1	2	8	9	1	2	3	4	8	56-57
Accounting	1	2	8	9	1	2	3	4	8	58-
Production/operations	1	2	8	9	1	2	3	4	8	60-61
Sales	1	2	8	9	1	2	3	4	8	62-
Research	1	2	8	9	1	2	3	4	8	64-
Inventory management	1	2	8	9	1	2	3	4	8	66-

13. Overall, how important are data communications to the success of your organization at this location? Is it ... **READ SCALE.**

	Very important	1
	Somewhat important	2
	Not very important	3
	Not at all important	4
DO NOT READ ⟶	Don't know	8

14. Which of the following features of data communications are important to your organization? **READ LIST.**

	Yes	No	Don't know	
Access to databases	1	2	8	6
Timeliness	1	2	8	
Economy, i.e., cheaper than alternative methods of sending or receiving information	1	2	8	7

2

15. **What percentage of your data communications from this location are made to other locations ... READ WHOLE LIST. REPEAT LIST ONE AT A TIME. MAKE SURE TOTAL EQUALS 100%.**

	%	Don't know	
(FOR QUEBEC AND ONTARIO ONLY)			
Within your area code	___	888	___ 5-7
Elsewhere in your province or territory	___	888	___ 8-1
Elsewhere in Canada	___	888	___ 11-13
In the U.S.	___	888	___ 14-1
Overseas	___	888	___ 17-1
TOTAL	100%		

16. **How does your organization transmit data? Does it transmit through ... READ LIST. CIRCLE ONE NUMBER OF EACH LINE.**

	Yes	No	Don't know	
Standard voice line	1	2	8	_ 2
Conditioned voice line	1	2	8	_ 2
Public carrier data network, e.g., Datapac	1	2	8	_ 2
Private line or network	1	2	8	_ 2

17. **Do you have in-house data communications networks, that is, data links inter-connecting computers or word processors at this location?**

Yes	1	
No	2	_ 2-
Don't know	8	

18. **Do any of the following prevent you from making more use of data communications? READ LIST.**

	Yes	No	Don't know	
Cost of service	1	2	8	_ 2
Availability of service	1	2	8	_ 2
Availability of technical expertise	1	2	8	_ 2
Compatibility of systems	1	2	8	_ 2

[redacted] there any other things that prevent you from making increased use [redacted] communications? PROBE. Any others?

________________________________ 29-

________________________________ → SKIP TO SECTION E 31-32

________________________________ 33-

20. How likely is your organization to use data communication services within the next three years? Is it ... READ SCALE.

Very likely	1
Somewhat likely	2
Not very likely	3
Not at all likely	4
DO NOT READ → Don't know	8

21. Do any of the following prevent you from using data communications? READ LIST.

	Yes	No	Don't know
Cost of service	1	2	8
Availability of service	1	2	8
Availability of technical expertise	1	2	8
Compatibility of systems	1	2	8

22. Are there any other barriers that prevent you from using data communications? PROBE. Any others?

________________________________ 40-

________________________________ 42-

________________________________ 44-

SECTION E: SPECIAL TELECOMMUNICATIONS SERVICES AND EQUIPMENT

23. At this location do you have any of the following? READ LIST

	Yes	No	
PBX system	1	2	_ 46
Centrex system	1	2	_ 47
Key system	1	2	_ 48

24. How many incoming lines do you have at this location?

______	lines	_ _ _ _
Don't know	8888	49-52

25. How many of the following does your organization have at this location? READ LIST.

	Number	Don't know	
Cellular telephone units	______	8888	_ _ _ _ 53-56
Mobile 2-way radio units	______	8888	_ _ _ _ 57-60
Paging units	______	8888	_ _ _ _ 61-64
TWX/TELEX machines	______	8888	_ _ _ _ 65-68
Facsimile machines	______	8888	_ _ _ _ 69-72

26. Does your organization have dedicated lines or a private network?

Yes 1
No 2 → SKIP TO INSTRUCTIONS
Don't know 8 BEFORE QUESTION 28

_ 73

3 1

_ _ _ 2-4

27. What percent of your dedicated lines or private network were used for ... READ WHOLE LIST. REPEAT LIST ONE AT A TIME. MAKE SURE TOTAL EQUALS 100%.

	%	Don't know	
Voice	______	888	_ _ _ 5-
Data	______	888	_ _ _ 8-1
Video	______	888	_ _ _ 11-1
TOTAL	100%		

[redacted]WER: ASK QUESTIONS 28, 29 AND 30 SIMULTANEOUSLY FOR EACH ITEM

28. Does your organization use ... READ ITEM. CIRCLE BELOW UNDER QUESTION 28.

29. IF "YES" IN QUESTION 28: Does your organization plan to make increased use of ______ in the next 2 to 3 years? RECORD BELOW UNDER QUESTION 29.

IF "NO" IN QUESTION 28: Does your organization plan to start using ______ in the next 2 to 3 years? RECORD BELOW UNDER QUESTION 29.

30. IF "YES" IN QUESTION 29: What factors will be important to this decision? DO NOT READ RESPONSE CATEGORIES. RECORD BELOW UNDER QUESTION 30. RECORD ALL THAT APPLY.

IF "DON'T KNOW" IN QUESTION 29: What factors will help you decide?

	QUESTION 28			QUESTION 29			QUESTION 30				
	Yes	No	Don't know	Yes	No	Don't know	Cost	Availability of service	Quality of service	Other	
Teleconferencing	1	2	8	1	2	8	1	2	3	4	14-1 16
Public electronic mail, e.g., Envoy or EOS	1	2	8	1	2	8	1	2	3	4	20-2 22
Database services, e.g., iNet	1	2	8	1	2	8	1	2	3	4	26-2 28
Wide area telephone service (WATS)	1	2	8	1	2	8	1	2	3	4	32-3 34
Zenith or "800" service	1	2	8	1	2	8	1	2	3	4	38 40

SECTION F: TELECOMMUNICATIONS COSTS AND INVESTMENTS

31. How much did your organization at this location spend in 1986 or during your last fiscal year on ...

	$	Don't know	Refused	
Telephone and other communication equipment purchased		888888	999999	44-49
Communication service operating costs such as local telephone costs, long distance calls and telephone and other communication equipment leases		888888	999999	50-55

SKIP TO QUESTION 33

32. What percentage of the telecommunications operating expenditures at this location went to ... READ LIST. IF NOT APPLICABLE WRITE "0". MAKE SURE TOTAL EQUALS 100%.

	%	Don't know	
Leased private lines		888	56-58
Public carrier data network services, e.g., Datapac		888	59-61
Local telephone services		888	62-64
Long distance telephone services		888	65-67
Telecommunications equipment rental or lease, e.g., PBXs, facsimile machines, mobile telephones, satellite receivers, etc.		888	68-70
Other telecommunications operating expenditures		888	71-73
TOTAL	100%		

4 1

2-4

INTERVIEWER: ASK QUESTIONS 33 AND 34 SIMULTANEOUSLY FOR EACH ITEM.

33. **ASK ONLY FOR ITEMS NOT EQUAL TO "0" IN QUESTION 32.** Have your operating expenditures for **(READ ITEM)** at this location increased, decreased or remained about the same over the past three years? **RECORD BELOW UNDER QUESTION 33.**

34. **ASK ONLY IF "INCREASED" OR "DECREASED" IN QUESTION 33.** Have they increased/decreased by less than 10%, 10 to 25%, 26 to 50% or more than 50% during the past three years? **RECORD BELOW UNDER QUESTION 34.**

	QUESTION 33				QUESTION 34					
	Increased	Decreased	Same	Don't know	Less than 10%	10 to 25%	26 to 50%	More than 50%	Don't know	
Leased private lines	1	2	3	8	1	2	3	4	8	5-6
Public carrier data network services	1	2	3	8	1	2	3	4	8	
Local telephone service	1	2	3	8	1	2	3	4	8	9-
Long distance telephone service	1	2	3	8	1	2	3	4	8	11-12
Telecommunications equipment rental or lease	1	2	3	8	1	2	3	4	8	13-1

35. Have your capital expenditures for telecommunications equipment increased, decreased or remained about the same over the past three years?

Increased	1
Decreased	2
About the same	3 → SKIP TO QUESTION 37
Don't know	8 → SKIP TO QUESTION 37

36. Have they increased/decreased by ... **READ SCALE.**

	Less than 10%	1
	10 to 25%	2
	26 to 50%	3
	More than 50%	4
DO NOT READ →	Don't know	8

37. Do you feel that you are getting good value from your expenditures on telecommunications?

Yes	1
No	2
Don't know	8

SECTION G: IMPACT ON SUCCESS AND LOCATION

38. To what extent have improvements and advances in telecommunication services impacted your office in each of the following areas during the past 5 years? READ LIST THEN SCALE. REPEAT FOR EACH ITEM.

					DO NOT READ		
	Very positive impact	Positive impact	No impact	Negative impact	Don't know	Not applicable	
Overall profitability	1	2	3	4	8	9	__ 18
Growth in business or revenues	1	2	3	4	8	9	__ 19
Expand to new or larger geographic markets	1	2	3	4	8	9	__ 20
Productivity	1	2	3	4	8	9	__ 21
Cost competitiveness of your products or services	1	2	3	4	8	9	__ 22
Location of your organization	1	2	3	4	8	9	__ 23

39. Do you think your organization is at a disadvantage compared to your competitors or other comparable organizations located elsewhere in Canada because of the cost of telecommunication services in your area?

Yes	1	
No	2	__ 24
Don't know	8	

40. And, do you think your organization is at a disadvantage compared to your competitors or other comparable organizations located elsewhere in Canada because of the availability of telecommunication services in your area?

Yes	1	
No	2	__ 25
Don't know	8	

41. In your opinion, how important is the cost of telecommunication services in deciding where to locate your organization? Is it ... READ SCALE.

	Very important	1	
	Somewhat important	2	__ 26
	Not very important	3	
	Not at all important	4	
DO NOT READ ⟶	Don't know	8 ⟶ SKIP TO QUESTION 43	

[redacted] do you say that? PROBE. Any other reasons?

________________________________ 27-28

________________________________ 29-3

________________________________ 31-32

43. And, in your opinion, how important is the availability of telecommunication services in deciding where to locate your organization? Is it ... READ SCALE.

Very important	1
Somewhat important	2
Not very important	3
Not at all important	4
Don't know	8 → SKIP TO SECTION H

_ 33

44. Why do you say that? PROBE. Any others?

________________________________ 34-

________________________________ 36-37

________________________________ 38-39

SECTION H: CLASSIFICATION OF ORGANIZATION

The following questions are for classification purposes only.

45. How many full time employees does your organization employ ... READ LIST. IF ONLY ONE LOCATION, USE SAME NUMBER FOR BOTH.

	No. of Employees	Don't know	
At this business location	____	888888	___ 40-45
Across Canada including this location	____	888888	___ 46-51

46. Which of the following industry sectors best describes your organization? READ LIST. CIRCLE ONE NUMBER ONLY. IF MORE THAN ONE SECTOR GIVEN, PROBE FOR THE ONE WHICH REPRESENTS THE GREATEST PART OF THE BUSINESS OR ACTIVITY.

Agriculture, forestry or fishing	1	
Mining	2	
Construction	3	
Manufacturing	4	52-53
Transportation, communication and public utilities	5	
Wholesale	6	
Retail	7	
Finance, insurance and/or real estate	8	
Services	9	
Government, non-profit and associations	10 → SKIP TO QUESTION 49	

47. In which of the following categories do the total revenues generated by your organization in 1986 or during your last fiscal year belong? READ SCALE.

	Less than $100,000	1	
	$100,000 to $1 million	2	
	$1 million to $10 million	3	
	$10 million to $50 million	4	__ 54
	$50 million to $500 million	5	
	More than $500 million	6	
DO NOT READ →	Don't know	8	→ SKIP TO QUESTION 49
	Refused	9	

48. What percent of these revenues are generated from ... READ LIST. MAKE SURE TOTAL EQUALS 100%.

	%	Don't know	
Local sales	___	888	55-
Sales elsewhere in your province or territory	___	888	58-
Sales elsewhere in Canada	___	888	61-
Sales in the U.S.	___	888	64-
Sales overseas	___	888	67-
TOTAL	100%		

49. Finally, for verification purposes and for the mailing of the survey results, could I please have your name, title and correct mailing address?

Name: ______________________________

Title: ______________________________ 70-

Company Name: ______________________________

Address: ______________________________

____

City,Province: ______________________________ 72-7

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* THANK AND TERMINATE *

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APPENDIX III

PROVINCIAL/TERRITORIAL
BREAKDOWN OF
BUSINESS USER SURVEY RESULTS

TABLE III-1

SAMPLE DISPOSITION BY PROVINCE/TERRITORY

Province/Territory	Completion Rate	Termination/ Refusal Rate
NFLD.	53%	6%
P.E.I.	56	8
N.S.	55	5
N.B.	48	11
QUEBEC	40	25
ONTARIO	39	20
MAN.	45	5
SASK.	49	7
ALTA.	33	9
B.C.	28	7
N.W.T.	62	4
YUKON	68	11
TOTAL SAMPLE	45	11

TABLE III-2

NUMBER OF EMPLOYEES (Q.45)

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	45	47	46	46	51	65	52	48	47	48	48	48	591
Mean Number of Full-Time Employees at Location	37	26	26	45	30	50	37	29	25	40	10	8	31
Median Number of Full-Time Employees at Location	10	10	9	13	10	17	11	10	12	15	5	5	9
Mean Number of Full-Time Employees in Canada	48	31	47	73	47	87	60	45	44	57	19	14	49
Median Number of Full-Time Employees in Canada	13	11	9	13	17	30	14	15	18	15	8	7	11

TABLE III-3

WHETHER RESPONDENT WORKS AT CANADIAN HEAD OFFICE (Q.1)

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	43	47	46	46	52	65	52	48	47	48	48	48	590
Yes, Works at Canadian Head Office	98%	96%	96%	100%	94%	100%	92%	98%	94%	100%	94%	96%	96%
No, Doesn't Work at Canadian Head Office	2%	4%	4%	0%	6%	0%	8%	2%	6%	0%	6%	4%	4%

TABLE III-4

BUSINESS LOCATIONS (Q.3) BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	45	47	46	46	52	64	52	48	47	48	48	48	591
In the Same City	29%	6%	22%	9%	6%	11%	19%	23%	23%	10%	4%	6%	14%
Elsewhere in Province/Territory	36%	17%	24%	17%	15%	31%	17%	27%	36%	17%	19%	13%	23%
Elsewhere in Canada	7%	11%	13%	15%	14%	17%	25%	13%	26%	10%	6%	8%	14%
In U.S.A.	0%	4%	2%	0%	6%	11%	0%	6%	9%	6%	0%	6%	4%
Overseas	4%	0%	2%	0%	8%	3%	2%	4%	6%	2%	0%	0%	3%

TABLE III-5

TOTAL REVENUES (Q.47) BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	34	43	36	39	39	44	44	45	41	41	42	41	489
Less Than $100,000	21%	14%	17%	23%	15%	18%	7%	9%	12%	22%	12%	15%	15%
$100,000 to $1 million	29%	51%	58%	33%	59%	34%	48%	44%	46%	29%	60%	63%	46%
$1 million to $10 million	24%	30%	14%	21%	13%	27%	27%	33%	32%	37%	29%	22%	26%
$10 million to $50 million	18%	5%	6%	21%	10%	18%	11%	11%	7%	7%	0%	0%	9%
$50 million to $500 million	9%	0%	6%	3%	3%	2%	5%	2%	2%	5%	0%	0%	3%
More than $500 million	0%	0%	0%	0%	0%	0%	2%	0%	0%	0%	0%	0%	0.2%

Note: Totals may not add due to rounding.

TABLE III-6

DISTRIBUTION OF ORGANIZATION'S REVENUE (Q.48)

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	34	42	37	32	39	43	40	44	40	38	42	43	474
Local Sales	65%	69%	70%	64%	70%	66%	50%	52%	64%	70%	71%	74%	66%
Sales Elsewhere in Province/Territory	20%	16%	16%	21%	13%	22%	21%	20%	30%	12%	21%	18%	19%
Sales Elsewhere in Canada	7%	12%	8%	7%	11%	10%	19%	12%	5%	10%	6%	5%	9%
Sales in the U.S.A.	1%	1%	4%	5%	5%	3%	7%	5%	1%	6%	1%	3%	3%
Sales Overseas	7%	1%	1%	3%	1%	1%	2%	9%	0%	4%	0%	0%	2%

TABLE III-7

IMPORTANCE OF LONG DISTANCE TELEPHONE SERVICES TO SUCCESS OF ORGANIZATIONS (Q.4)

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	45	47	46	46	52	65	52	48	47	48	48	48	592
Very Important	78%	72%	74%	80%	69%	77%	81%	83%	70%	52%	90%	77%	75%
Somewhat Important	13%	19%	17%	11%	14%	9%	17%	10%	23%	33%	10%	15%	16%
Not Very Important	9%	9%	2%	4%	12%	12%	2%	6%	4%	8%	0%	8%	7%
Not at All Important	0%	0%	7%	4%	6%	2%	0%	0%	2%	6%	0%	0%	2%

TABLE III-8

DISTRIBUTION OF LONG DISTANCE CALLS

BY DESTINATION OF CALL (Q.5)

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	44	47	46	45	49	62	50	48	47	48	48	48	582
Within Area Code Elsewhere in Province/Territory	64%	64%	69%	67%	58 26 84%	54 24 78%	64%	63%	72%	64%	47%	37%	64%
Elsewhere in Canada	29%	32%	28%	28%	6%	14%	30%	30%	25%	20%	51%	59%	29%
In the U.S.A.	3%	3%	2%	4%	6%	7%	4%	5%	2%	14%	2%	3%	5%
Overseas	4%	2%	1%	1%	3%	1%	2%	2%	0%	3%	0%	0%	2%

TABLE III-9

USE OF COMPUTERS IN OFFICES (Q.6)

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	45	47	46	46	52	65	52	48	47	48	48	48	592
Yes, Computer Used	51%	47%	41%	57%	40%	62%	52%	58%	62%	56%	60%	50%	53%
No, Computer Not Used	49%	53%	59%	43%	60%	38%	48%	42%	38%	44%	40%	50%	47%

TABLE III-10

TYPES OF COMPUTERS USED (Q.7)[1]

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	23	23	19	25	21	40	27	28	29	27	27	24	313
Personal Computers	70%	65%	74%	72%	67%	73%	89%	75%	86%	70%	67%	75%	74%
Minicomputers	48%	39%	44%	25%	48%	38%	41%	32%	32%	41%	36%	13%	36%
Mainframes	22%	26%	53%	46%	33%	42%	26%	29%	43%	19%	32%	21%	33%

---

[1] Asked only of those respondents whose organizations use computers.

TABLE III-11

AREAS OF COMPUTERIZATION IN ORGANIZATIONS (Q.8)

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	23	21	19	26	21	39	27	26	28	26	29	24	309
Accounting	91%	68%	95%	85%	86%	93%	89%	89%	90%	93%	90%	79%	88%
Administration	74%	71%	90%	69%	86%	87%	89%	89%	82%	69%	83%	75%	81%
Production/Operations	30%	57%	53%	54%	57%	69%	56%	62%	46%	73%	63%	58%	57%
Inventory Management	52%	50%	58%	50%	43%	55%	59%	59%	43%	33%	59%	58%	52%
Sales	39%	41%	58%	35%	60%	63%	52%	48%	39%	27%	59%	38%	47%
Research	13%	23%	32%	12%	40%	23%	23%	26%	21%	8%	31%	29%	23%

TABLE III-12

USE OF DATA COMMUNICATIONS (Q.10)[1]

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	23	21	19	26	21	39	27	27	29	27	29	23	311
Yes, Use Data Communications	9%	24%	26%	31%	29%	33%	52%	41%	31%	26%	24%	22%	30%
No, Do Not Use Data Communications	91%	76%	74%	69%	71%	67%	48%	59%	69%	74%	76%	78%	70%

---

[1] Asked only of those organizations which use computers.

TABLE III-13

TYPE OF TELECOMMUNICATIONS SYSTEMS USED (Q.23)

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	44	47	46	46	52	63	51	48	47	47	48	48	587
PBX	11%	17%	13%	22%	14%	19%	2%	10%	17%	21%	13%	23%	15%
Key	9%	17%	11%	30%	14%	23%	4%	19%	23%	15%	19%	4%	16%
Centrex	9%	2%	2%	4%	4%	3%	0%	6%	0%	0%	0%	0%	3%

TABLE III-14

USE OF TELECOMMUNICATIONS EQUIPMENT (Q.25)

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	44	46	46	46	52	65	51	48	47	48	48	48	589
Cellular Phones	13.6%	8.5%	15.2%	6.7%	21.2%	17.5%	4.5%	26.2%	10.6%	20.8%	8.3%	2.1%	14.0%
Mobile 2-Way Radios	20.0%	29.8%	23.9%	21.7%	21.2%	23.4%	35.3%	35.4%	42.6%	30.4%	29.2%	29.8%	28.4%
Paging Units	28.9%	23.4%	21.7%	30.4%	26.9%	46.9%	27.6%	29.2%	36.2%	29.8%	20.8%	10.4%	27.3%
TWX/Telex	40.0%	10.6%	19.6%	26.1%	21.2%	28.5%	26.9%	25.0%	14.9%	27.1%	39.6%	16.7%	23.6%
Facsimile	27.8%	8.5%	15.2%	13.0%	30.8%	19.0%	19.6%	12.5%	10.6%	18.7%	14.6%	6.2%	15.8%

TABLE III-15

TELECOMMUNICATIONS SYSTEMS CHARACTERISTICS (Q.24,25,)[1]

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	44	46	46	46	52	65	51	48	47	48	48	48	589
Incoming Lines (Mean)	5.0%	3.0%	8.3%	9.0%	5.1%	5.4%	3.7%	6.4%	4.9%	7.2%	6.1%	2.7%	5.6%
Incoming Lines (Median)	3.0%	3.0%	2.0%	3.0%	2.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	2.0%	3.0%
Cellular Telephone Units (Mean)	16.5%	4.3%	3.3%	2.0%	1.7%	7.5%	2.0%	9.5%	1.8%	12.8%	5.0%	1.0%	7.0%
Cellular Telephone Units (Median)	4.0%	2.0%	3.0%	2.0%	1.0%	4.0%	2.0%	4.0%	1.0%	1.0%	5.5%	1.0%	2.0%
Mobile 2-way Radios (Mean)	5.3%	5.1%	23.7%	8.5%	5.9%	11.3%	4.3%	5.7%	5.4%	7.7%	3.7%	2.4%	7.0%
Mobile 2-way Radios (Median)	4.0%	3.0%	3.0%	4.5%	3.0%	7.0%	3.0%	4.0%	4.0%	4.5%	3.5%	1.5%	3.0%
Paging Units (Mean)	5.1%	2.4%	3.9%	8.1%	8.8%	9.9%	1.2%	6.0%	4.2%	5.6%	5.3%	6.6%	6.2%
Paging Units (Median)	2.0%	2.0%	1.5%	2.0%	1.5%	2.5%	1.0%	3.0%	2.0%	2.0%	1.5%	2.0%	2.0%
TWX/Telex Machines (Mean)	1.0%	1.2%	1.0%	1.1%	1.5%	1.2%	1.2%	1.1%	1.0%	1.3%	1.0%	1.8%	1.2%
TWX/Telex Machines (Median)	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
FAX Machines (Mean)	1.0%	1.3%	1.1%	1.3%	1.1%	1.0%	1.0%	1.2%	1.0%	1.3%	1.0%	1.0%	1.1%
FAX Machines (Median)	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%

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[1] Indicates only firms with the above equipment.

TABLE III-16

USE OF DEDICATED LINES OR PRIVATE NETWORKS (Q.26)

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	45	47	45	44	52	60	41	42	44	31	45	45	541
Yes, Uses Dedicated Lines or Private Networks	13%	11%	16%	11%	21%	18%	24%	45%	18%	32%	31%	27%	22%
No, Doesn't Use Dedicated Lines or Private Networks	87%	89%	84%	89%	79%	82%	76%	55%	82%	68%	69%	73%	78%

TABLE III-17

TELECOMMUNICATIONS SERVICES USED (Q.28)

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	45	47	46	46	52	65	52	48	47	48	47	48	591
Teleconferencing	13%	30%	15%	33%	29%	25%	17%	31%	23%	19%	36%	21%	24%
Public Electronic Mail (e.g. Envoy)	2%	6%	4%	11%	6%	5%	2%	4%	7%	6%	11%	6%	6%
Data Base Services (e.g. INet)	0%	9%	4%	9%	8%	7%	14%	17%	11%	4%	13%	2%	8%
Wide Area Telephone Service (WATS)	7%	9%	17%	15%	14%	20%	20%	8%	9%	15%	11%	16%	14%
Zenith or 800 Service	16%	9%	13%	9%	14%	23%	29%	10%	23%	10%	50%	73%	23%

TABLE III-18

PLANNED INCREASE IN THE USE OF TELECOMMUNICATIONS SERVICES (Q.29)

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	40	45	45	43	46	58	51	47	46	44	45	45	555
Teleconferencing	10%	9%	22%	19%	22%	24%	12%	21%	15%	9%	20%	20%	17%
Public Electronic Mail (e.g. Envoy)	12%	9%	2%	11%	10%	14%	2%	11%	7%	7%	16%	7%	9%
Data Base Services (e.g. INet)	9%	9%	9%	16%	22%	17%	17%	26%	16%	9%	26%	10%	15%
Wide Area Telephone Service (WATS)	10%	4%	11%	20%	18%	22%	9%	11%	17%	9%	12%	17%	14%
Zenith or 800 Service	18%	6%	11%	9%	16%	18%	13%	17%	14%	11%	45%	63%	20%

TABLE III-19

TELECOMMUNICATIONS EXPENDITURES (Q.31)

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	35	42	38	37	40	53	42	47	45	48	46	45	518
Equipment Expenditure (Mean)	$ 7,127	$ 4,230	$10,101	$ 584	$ 4,810	$ 9,550	$ 2,357	$ 3,587	$ 6,084	$ 6,651	$13,006	$ 3,076	$ 6,039
Service Costs (Mean)	$28,917	8,431	10,427	23,659	16,273	21,834	19,328	30,942	23,122	20,539	11,861	6,022	18,501

TABLE III-20

DISTRIBUTION OF TELECOMMUNICATIONS OPERATING EXPENDITURES (Q. 32)

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	44	47	45	44	47	58	46	48	46	44	47	48	564
Long Distance Calls	45%	50%	47%	46%	43%	41%	59%	66%	43%	47%	71%	68%	52%
Local Services	46%	44%	50%	50%	38%	45%	25%	18%	43%	48%	19%	24%	37%
Equipment Rentals	5%	3%	3%	1%	11%	7%	6%	9%	7%	2%	6%	6%	5%
Leased Private Lines	1%	3%	1%	1%	4%	5%	7%	6%	6%	1%	3%	1%	3%
Public Carrier Data Networks	1%	0%	0%	0%	2%	1%	2%	1%	1%	1%	1%	1%	1%
Other	2%	1%	0%	1%	1%	3%	1%	2%	2%	1%	1%	1%	1%

TABLE III-21

SIZE OF TELECOMMUNICATIONS COSTS CHANGES (Q. 36) BY PROVINCE/TERRITORY

	Province of Respondent Office																								Total	
	Nfld		P.E.I.		N.S.		N.B.		Quebec		Ont.		Man.		Sask.		Alta		B.C.		N.W.T.		Yukon		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Change in Operating Costs for Leased Private Lines																										
10 to 25% decrease....	0	0	0	0	1	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Less than 10% decrease	0	0	0	0	0	0	0	0	1	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
About the same........	3	60	2	40	1	25	2	50	6	38	9	53	6	43	7	64	8	57	3	75	3	30	2	33	52	47
Less than 10% increase	2	40	1	20	1	25	1	25	4	25	1	6	3	21	1	9	4	29	1	25	4	40	1	17	24	22
10 to 25% increase....	0	0	2	40	1	25	1	25	5	31	6	35	4	29	2	18	1	7	0	0	1	10	3	50	26	24
26 to 50% increase....	0	0	0	0	0	0	0	0	0	0	1	6	0	0	0	0	1	7	0	0	2	20	0	0	4	4
More than 50% increase	0	0	0	0	0	0	0	0	0	0	0	0	1	7	1	9	0	0	0	0	0	0	0	0	2	2
Total................	5	100	5	100	4	100	4	100	16	100	17	100	14	100	11	100	14	100	4	100	10	100	6	100	110	100
Change in Operating Costs for Public Carrier Data Network																										
26 to 50% decrease....	0	0	0	0	0	0	0	0	1	20	0	0	1	7	0	0	0	0	0	0	0	0	0	0	2	5
About the same........	0	0	0	0	0	0	0	0	0	0	6	86	8	57	3	75	6	100	0	0	2	50	2	100	27	61
Less than 10% increase	1	100	0	0	0	0	0	0	0	0	1	14	2	14	0	0	0	0	0	0	1	25	0	0	5	11
10 to 25% increase....	0	0	0	0	0	0	0	0	3	60	0	0	3	21	0	0	0	0	0	0	1	25	0	0	7	16
More than 50% increase	0	0	0	0	0	0	0	0	1	20	0	0	0	0	1	25	0	0	1	100	0	0	0	0	3	7
Total................	1	100	0	0	0	0	0	0	5	100	7	100	14	100	4	100	6	100	1	100	4	100	2	100	44	100

TABLE III-21

SIZE OF TELECOMMUNICATIONS COSTS CHANGES (Q. 36) BY PROVINCE/TERRITORY (CONTINUED)

	Province of Respondent Office																								Total	
	Nfld		P.E.I.		N.S.		N.B.		Quebec		Ont.		Man.		Sask.		Alta		B.C.		N.W.T.		Yukon		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Change in Operating Costs for Local Telephone Service																										
More than 50% decrease	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	1	2	2	0
26 to 50% decrease....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	1	0
10 to 25% decrease....	0	0	1	2	2	5	1	2	0	0	1	2	0	0	0	0	2	4	0	0	0	0	1	2	8	1
Less than 10% decrease	0	0	0	0	2	5	1	2	2	4	2	4	0	0	0	0	2	4	0	0	0	0	0	0	9	2
About the same........	19	49	16	36	14	33	15	33	20	43	15	28	14	32	15	34	21	46	21	45	12	29	10	22	192	36
Less than 10% increase	6	15	5	11	8	19	12	27	11	23	14	26	11	25	11	25	12	26	10	21	11	27	19	42	130	24
10 to 25% increase....	13	33	21	47	12	28	11	24	10	21	15	28	18	41	15	34	7	15	11	23	15	37	11	24	159	29
26 to 50% increase....	1	3	1	2	4	9	3	7	1	2	4	7	0	0	1	2	1	2	1	2	2	5	2	4	21	4
More than 50% increase	0	0	1	2	1	2	2	4	3	6	2	4	1	2	2	5	1	2	3	6	1	2	1	2	18	3
Total................	39	100	45	100	43	100	45	100	47	100	54	100	44	100	44	100	46	100	47	100	41	100	45	100	540	100
Change in Operating Costs for Long Distance Telephone																										
More than 50% decrease	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	1	2	2	0
26 to 50% decrease....	0	0	0	0	2	5	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	1	2	4	1
10 to 25% decrease....	0	0	0	0	1	3	0	0	0	0	0	0	0	0	1	2	3	7	0	0	0	0	2	5	7	1
Less than 10% decrease	1	3	1	2	1	3	1	3	2	4	5	9	0	0	0	0	1	2	0	0	1	2	0	0	13	2
About the same........	14	39	14	32	13	33	17	44	17	37	17	31	13	28	13	29	16	36	21	49	9	21	11	25	175	33
Less than 10% increase	7	19	6	14	8	20	10	26	15	33	7	13	7	15	10	22	11	24	8	19	9	21	10	23	108	21
10 to 25% increase....	11	31	19	43	12	30	9	23	8	17	21	38	21	46	16	36	10	22	7	16	16	37	12	27	162	31
26 to 50% increase....	1	3	2	5	2	5	1	3	2	4	4	7	3	7	3	7	2	4	2	5	4	9	5	11	31	6
More than 50% increase	2	6	2	5	1	3	1	3	2	4	1	2	2	4	2	4	1	2	4	9	4	9	2	5	24	5
Total................	36	100	44	100	40	100	39	100	46	100	55	100	46	100	45	100	45	100	43	100	43	100	44	100	526	100

TABLE III-21

SIZE OF TELECOMMUNICATIONS COSTS CHANGES (Q. 36) BY PROVINCE/TERRITORY (CONTINUED)

	Province of Respondent Office																								Total	
	Nfld		P.E.I.		N.S.		N.B.		Quebec		Ont.		Man.		Sask.		Alta		B.C.		N.W.T.		Yukon		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Change in Operating Costs for Telecom. Equipment Rental																										
More than 50% decrease	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	11	0	0	2	1
26 to 50% decrease....	0	0	0	0	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
10 to 25% decrease....	1	8	0	0	0	0	0	0	0	0	1	5	1	5	0	0	0	0	1	9	0	0	1	7	5	3
Less than 10% decrease	0	0	0	0	1	11	0	0	1	5	1	5	0	0	0	0	0	0	0	0	1	6	1	7	5	3
About the same........	10	77	3	43	5	56	4	67	10	45	8	42	11	50	10	45	10	71	4	36	9	50	8	57	92	52
Less than 10% increase	0	0	2	29	1	11	1	17	2	9	5	26	4	18	3	14	2	14	3	27	5	28	1	7	29	16
10 to 25% increase....	2	15	2	29	2	22	0	0	4	18	3	16	5	23	5	23	2	14	2	18	1	6	2	14	30	17
26 to 50% increase....	0	0	0	0	0	0	0	0	1	5	0	0	0	0	2	9	0	0	0	0	0	0	1	7	4	2
More than 50% increase	0	0	0	0	0	0	1	17	3	14	1	5	1	5	2	9	0	0	1	9	0	0	0	0	9	5
Total.................	13	100	7	100	9	100	6	100	22	100	19	100	22	100	22	100	14	100	11	100	18	100	14	100	177	100
Change in Capital Costs for Telecommunication Equipment																										
More than 50% decrease	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	1	0
10 to 25% decrease....	1	2	0	0	1	2	0	0	0	0	0	0	0	0	0	0	2	5	1	2	0	0	0	0	5	1
Less than 10% decrease	0	0	0	0	1	2	0	0	1	2	1	2	0	0	0	0	0	0	0	0	1	2	0	0	4	1
About the same........	27	66	33	79	27	66	33	83	25	53	38	66	31	66	34	77	30	73	26	58	27	59	30	64	361	67
Less than 10% increase	5	12	0	0	4	10	0	0	5	11	5	9	3	6	2	5	2	5	6	13	3	7	2	4	37	7
10 to 25% increase....	7	17	8	19	5	12	5	13	13	28	11	19	7	15	4	9	5	12	5	11	10	22	9	19	89	17
26 to 50% increase....	1	2	0	0	3	7	1	3	1	2	1	2	1	2	1	2	0	0	2	4	4	9	2	4	17	3
More than 50% increase	0	0	1	2	0	0	1	3	2	4	2	3	5	11	3	7	1	2	5	11	1	2	4	9	25	5
Total.................	41	100	42	100	41	100	40	100	47	100	58	100	47	100	44	100	41	100	45	100	46	100	47	100	539	100

TABLE III-22

WHETHER ORGANIZATIONS RECEIVE GOOD VALUE FOR TELECOMMUNICATIONS EXPENDITURES (Q.37)

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	44	46	46	44	52	64	49	45	46	46	47	48	577
Yes, Receives Good Value	89%	89%	87%	84%	94%	95%	82%	91%	94%	87%	68%	79%	87%
No, Doesn't Receive Good Value	11%	11%	13%	16%	6%	5%	18%	9%	6%	13%	32%	21%	13%

TABLE III-23

IMPACT OF TELECOMMUNICATIONS ADVANCES AND IMPROVEMENTS UPON ORGANIZATION (Q. 38) BY PROVINCE/TERRITORY

	Province of Respondent Office																								Total	
	Nfld		P.E.I.		N.S.		N.B.		Quebec		Ont.		Man.		Sask.		Alta		B.C.		N.W.T.		Yukon		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Impact of Telecommunications on Overall Profitability																										
Very Positive Impact..	1	3	3	7	5	11	2	5	21	43	9	15	5	11	5	10	0	0	1	2	5	11	4	8	61	11
Positive Impact.......	28	70	24	52	25	54	24	59	21	43	25	42	21	46	24	50	21	46	18	41	27	57	22	46	280	50
No Impact.............	11	28	19	41	16	35	15	37	7	14	24	41	20	43	19	40	23	50	21	48	13	28	21	44	209	37
Negative Impact.......	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	2	4	4	9	2	4	1	2	10	2
Total.................	40	100	46	100	46	100	41	100	49	100	59	100	46	100	48	100	46	100	44	100	47	100	48	100	560	100
Impact of Telecommunications on Business/Revenue Growth																										
Very Positive Impact..	2	5	6	13	4	9	2	5	13	29	7	12	5	11	3	6	1	2	2	5	1	2	4	9	50	9
Positive Impact.......	22	58	22	48	27	59	26	60	23	51	28	48	24	51	23	49	18	40	11	25	28	58	23	49	275	50
No Impact.............	14	37	18	39	15	33	15	35	9	20	23	40	18	38	20	43	26	58	27	61	16	33	19	40	220	40
Negative Impact.......	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	4	9	3	6	1	2	9	2
Total.................	38	100	46	100	46	100	43	100	45	100	58	100	47	100	47	100	45	100	44	100	48	100	47	100	554	100
Impact of Telecommunications on Geographic Market Expansion																										
Very Positive Impact..	2	5	2	4	5	11	1	2	7	16	4	7	7	17	3	6	2	5	1	2	1	2	4	9	39	7
Positive Impact.......	14	36	12	26	13	29	11	27	13	30	15	26	8	19	12	26	6	14	5	11	17	37	13	28	139	26
No Impact.............	22	56	33	70	27	60	29	71	23	53	38	67	27	64	31	66	33	75	31	69	26	57	29	62	349	64
Negative Impact.......	1	3	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	7	8	18	2	4	1	2	16	3
Total.................	39	100	47	100	45	100	41	100	43	100	57	100	42	100	47	100	44	100	45	100	46	100	47	100	543	100

TABLE III-23

IMPACT OF TELECOMMUNICATIONS ADVANCES AND IMPROVEMENTS UPON ORGANIZATION (Q. 38) BY PROVINCE/TERRITORY (CONTINUED)

	Province of Respondent Office																								Total	
	Nfld		P.E.I.		N.S.		N.B.		Quebec		Ont.		Man.		Sask.		Alta		B.C.		N.W.T.		Yukon		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Impact of Telecommunications on Productivity																										
Very Positive Impact..	0	0	1	2	4	9	1	2	18	35	5	9	6	13	5	11	3	7	4	9	5	10	5	10	57	10
Positive Impact.......	22	54	20	43	16	36	21	49	24	47	25	45	28	58	18	39	23	50	8	17	24	50	22	46	251	45
No Impact.............	18	44	25	54	25	56	21	49	9	18	24	44	14	29	23	50	19	41	30	65	17	35	19	40	244	43
Negative Impact.......	1	2	0	0	0	0	0	0	0	0	1	2	0	0	0	0	1	2	4	9	2	4	2	4	11	2
Total.................	41	100	46	100	45	100	43	100	51	100	55	100	48	100	46	100	46	100	46	100	48	100	48	100	563	100
Impact of Telecommunications on Cost Competitiveness																										
Very Positive Impact..	0	0	4	9	2	4	2	5	7	17	3	5	6	14	1	2	2	4	0	0	3	7	3	7	33	6
Positive Impact.......	12	31	14	30	15	33	15	37	14	33	19	34	15	35	15	34	18	40	8	18	18	40	17	37	180	33
No Impact.............	26	67	29	62	29	63	23	56	19	45	33	59	22	51	28	64	23	51	33	75	20	44	24	52	309	57
Negative Impact.......	1	3	0	0	0	0	1	2	2	5	1	2	0	0	0	0	2	4	3	7	4	9	2	4	16	3
Total.................	39	100	47	100	46	100	41	100	42	100	56	100	43	100	44	100	45	100	44	100	45	100	46	100	538	100
Impact of Telecommunications on Office Location																										
Very Positive Impact..	1	3	2	5	2	5	1	3	12	29	4	7	2	4	3	7	1	2	1	2	0	0	1	2	30	6
Positive Impact.......	16	42	9	21	12	27	9	23	13	32	18	33	9	19	8	18	11	23	6	13	17	35	15	32	143	27
No Impact.............	20	53	31	74	30	68	27	68	16	39	32	58	36	77	34	76	34	72	29	64	28	58	29	62	346	64
Negative Impact.......	1	3	0	0	0	0	3	8	0	0	1	2	0	0	0	0	1	2	9	20	3	6	2	4	20	4
Total.................	38	100	42	100	44	100	40	100	41	100	55	100	47	100	45	100	47	100	45	100	48	100	47	100	539	100

TABLE III-24

WHETHER ORGANIZATIONS FACE COMPETITIVE DISADVANTAGE DUE TO TELECOMMUNICATIONS COSTS AND SERVICE AVAILABILITY (Q.39, 40)

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	42	44	45	45	50	61	46	46	45	44	47	43	558
Yes, Costs Create Competitive Disadvantage	19	27	13	13	16	7	24	20	18	16	60	58	24
No, Costs Don't Create Competitive Disadvantage	81	73	87	87	84	93	76	80	82	84	40	42	76
Yes, Service Availability Does Create Competitive Disadvantage	14	21	16	16	8	16	15	22	13	9	44	38	19
No, Service Availability Doesn't Create Competitive Disadvantage	86	79	84	84	92	84	85	78	87	91	56	62	81

TABLE III-25

IMPORTANCE OF TELECOMMUNICATIONS COSTS AND SERVICE AVAILABILITY (Q.41, 43) IN ORGANIZATION LOCATION DECISION

BY PROVINCE/TERRITORY

	PROVINCE/TERRITORY												
Telecom Costs	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	N.W.T.	YUKON	TOTAL
Sample Size	43	42	42	46	51	60	52	47	45	42	46	48	564
Very Important	9%	10%	26%	13%	26%	17%	10%	11%	18%	2%	11%	13%	14%
Somewhat Important	19%	17%	19%	13%	14%	15%	21%	15%	16%	17%	20%	17%	17%
Not Very Important	28%	21%	5%	15%	33%	23%	33%	30%	24%	17%	35%	29%	25%
Not At All Important	44%	52%	50%	59%	27%	45%	36%	44%	42%	64%	34%	41%	44%
Service Availability													
Sample Size	41	43	43	44	52	57	50	48	46	40	48	48	560
Very Important	10%	16%	28%	23%	44%	23%	26%	13%	20%	5%	29%	38%	23%
Somewhat Important	15%	26%	16%	23%	21%	23%	12%	23%	11%	8%	29%	25%	20%
Not Very Important	32%	9%	12%	23%	15%	21%	30%	17%	32%	13%	15%	17%	20%
Not At All Important	43%	49%	44%	32%	19%	33%	32%	47%	37%	74%	27%	20%	37%

TABLE III-26

REASONS FOR IMPORTANCE/UNIMPORTANCE OF TELECOMMUNICATIONS COSTS IN LOCATION DECISION (Q. 42) BY PROVINCE/TERRITORY

	Province of Respondent Office																								Total	
	Nfld		P.E.I.		N.S.		N.B.		Quebec		Ont.		Man.		Sask.		Alta		B.C.		N.W.T.		Yukon		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Why Cost Important or Not Important in Locating Organization																										
Important - Need telecom. services/ important to business...........	5	12	5	12	8	19	2	5	3	6	9	16	5	10	3	7	5	11	1	2	4	9	1	2	51	9
Important - Cannot afford high cost/ important to save money..............	1	2	0	0	5	12	2	5	5	10	2	3	1	2	2	5	1	2	0	0	4	9	0	0	23	4
Important - Always an important consideration in business...........	1	2	0	0	1	2	1	2	2	4	1	2	4	8	1	2	2	5	1	2	4	9	2	4	20	4
Important - Need long distance links/ located in remote area...............	0	0	0	0	1	2	1	2	5	10	1	2	1	2	2	5	2	5	2	5	3	7	4	8	22	4
Important - If relocating/ expanding/ changing	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	2	4	5	1
Important - Established here/ good location......	1	2	5	12	1	2	0	0	0	0	2	3	0	0	0	0	2	5	0	0	0	0	0	0	11	2
Important - Other reasons...........	2	5	1	2	4	10	6	14	5	10	8	14	8	15	3	7	4	9	3	7	2	4	6	13	52	9
Not Important - Need services regardless of cost............	0	0	1	2	0	0	1	2	1	2	3	5	1	2	3	7	1	2	7	17	10	22	10	21	38	7

Note: In the body of these tables, "n" equals the number of responses in each category. Responses are totalled across the row in each province. However, the total number of respondents (i.e. firms) is shown at the bottom of the table under the "n" column. The percentage calculations shown are based only on the number of respondents. This was done in order to indicate the proportion of firms in each province responding to each item and thereby provide a more significant comparison to the importance of different reasons across all the provinces. Because of multiple responses, the percentages if added downward will exceed 100%.

TABLE III-26

REASONS FOR IMPORTANCE/UNIMPORTANCE OF TELECOMMUNICATIONS COSTS IN LOCATION DECISION (Q. 42) BY PROVINCE/TERRITORY (CONTINUED)

	Province of Respondent Office																								Total	
	Nfld		P.E.I.		N.S.		N.B.		Quebec		Ont.		Man.		Sask.		Alta		B.C.		N.W.T.		Yukon		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Not Important - Local business/ cannot relocate...........	11	27	14	34	9	21	12	28	5	10	13	22	12	23	12	27	7	16	6	15	9	20	10	21	120	22
Not Important - Other factors more important..........	4	10	1	2	0	0	5	12	6	12	5	9	6	12	8	18	6	14	2	5	3	7	4	8	50	9
Not Important - Telecom. not important to our business...........	14	34	10	24	9	21	11	26	7	14	11	19	15	29	13	30	11	25	14	34	11	24	15	31	141	26
Not Important - Comparable costs/services available anywhere.	1	2	4	10	3	7	3	7	3	6	2	3	7	13	2	5	3	7	5	12	7	16	3	6	43	8
Not Important - Other reasons............	2	5	4	10	3	7	5	12	11	22	10	17	5	10	2	5	10	23	6	15	9	20	10	21	77	14
Total.................	41		41		42		43		50		58		52		44		44		41		45		48		549	

Note: In the body of these tables, "n" equals the number of responses in each category. Responses are totalled across the row in each province. However, the total number of respondents (i.e. firms) is shown at the bottom of the table under the "n" column. The percentage calculations shown are based only on the number of respondents. This was done in order to indicate the proportion of firms in each province responding to each item and thereby provide a more significant comparison to the importance of different reasons across all the provinces. Because of multiple responses, the percentages if added downward will exceed 100%.

TABLE III-27

REASONS FOR IMPORTANCE/UNIMPORTANCE OF TELECOMMUNICATIONS SERVICE AVAILABILITY IN LOCATION DECISION (Q.44) BY PROVINCE/TERRITORY

	Province of Respondent Office																								Total	
	Nfld		P.E.I.		N.S.		N.B.		Quebec		Ont.		Man.		Sask.		Alta		B.C.		N.W.T.		Yukon		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Why Availability Important or Not in Locating Organization																										
Important - Need telecom. services/ important to business...........	7	18	11	26	10	24	9	23	12	24	12	21	6	12	9	19	3	7	1	3	16	36	17	35	113	21
Important - Use telecom. services a lot................	0	0	1	2	0	0	0	0	4	8	1	2	4	8	0	0	2	5	0	0	0	0	1	2	13	2
Important - Due to cost considerations/profitability..........	0	0	0	0	3	7	1	3	1	2	2	4	1	2	2	4	2	5	0	0	4	9	2	4	18	3
Important - Need long distance links/ located in remote area...............	0	0	0	0	1	2	0	0	3	6	0	0	1	2	0	0	1	2	0	0	6	14	5	10	17	3
Important - Only if relocating/expanding..................	0	0	1	2	0	0	2	5	0	0	3	5	0	0	0	0	2	5	0	0	1	2	3	6	12	2
Important - Availability good in present location	0	0	2	5	0	0	3	8	7	14	1	2	1	2	0	0	1	2	0	0	0	0	2	4	17	3
Important - Other reasons............	2	5	2	5	5	12	5	13	11	22	12	21	7	14	5	11	7	16	4	10	15	34	14	29	89	16
Not Important - Needed services currently available here.....	2	5	4	10	1	2	5	13	5	10	2	4	4	8	5	11	2	5	2	5	0	0	3	6	35	6
Not Important - Local business/ cannot relocate...........	7	18	13	31	7	17	4	10	5	10	8	14	6	12	10	21	12	28	7	18	1	2	5	10	85	16

Note: In the body of these tables, "n" equals the number of responses in each category. Responses are totalled across the row in each province. However, the total number of respondents (i.e. firms) is shown at the bottom of the table under the "n" column. The percentage calculations shown are based only on the number of respondents. This was done in order to indicate the proportion of firms in each province responding to each item and thereby provide a more significant comparison to the importance of different reasons across all the provinces. Because of multiple responses, the percentages if added downward will exceed 100%.

TABLE III-27

REASONS FOR IMPORTANCE/UNIMPORTANCE OF TELECOMMUNICATIONS SERVICE AVAILABILITY IN LOCATION DECISION (Q.44) BY PROVINCE/TERRITORY (CONTINUED)

	Province of Respondent Office																								Total	
	Nfld		P.E.I.		N.S.		N.B.		Quebec		Ont.		Man.		Sask.		Alta		B.C.		N.W.T.		Yukon		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Not Important - Other factors more important..........	2	5	1	2	0	0	2	5	0	0	6	11	6	12	4	9	5	12	6	15	0	0	2	4	34	6
Not Important - Telecom. not important to our business...........	11	29	6	14	8	19	7	18	1	2	8	14	7	14	5	11	8	19	8	21	7	16	5	10	81	15
Not Important - Can get services anywhere...........	0	0	1	2	3	7	1	3	1	2	2	4	3	6	4	9	3	7	7	18	1	2	1	2	27	5
Not Important - Other reasons............	7	18	4	10	7	17	3	8	6	12	8	14	7	14	7	15	10	23	6	15	12	27	8	17	85	16
Total.................	38		42		42		40		50		57		50		47		43		39		44		48		540	

Note: In the body of these tables, "n" equals the number of responses in each category. Responses are totalled across the row in each province. However, the total number of respondents (i.e. firms) is shown at the bottom of the table under the "n" column. The percentage calculations shown are based only on the number of respondents. This was done in order to indicate the proportion of firms in each province responding to each item and thereby provide a more significant comparison to the importance of different reasons across all the provinces. Because of multiple responses, the percentages if added downward will exceed 100%.

APPENDIX IV

INDUSTRIAL SECTOR BREAKDOWN OF BUSINESS USER SURVEY RESULTS

TABLE IV-1

SAMPLE DISPOSITION BY INDUSTRIAL SECTOR

Industry	Completed Interviews	Termination/ Refusal Rate
	Number	%
AGRI/FORESTRY/FISH	65	11.0
MINING	31	5.2
CONSTRUCTION	54	9.1
MANUFACTURING	67	11.3
TRANS/COMM/UTILITIES	59	10.0
WHOLESALE	38	6.4
RETAIL	85	14.4
FIN/INS/REAL ESTATE	42	7.1
SERVICES	99	16.7
GOV'T/NON-PROFIT	52	8.8
TOTAL SAMPLE	592	100.0

TABLE IV-2

NUMBER OF EMPLOYEES (Q.45)

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS/ REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	65	31	54	67	59	38	85	42	99	52	592
Mean Number of Full-Time Employees at Location	23	27	18	49	28	29	20	20	48	30	31
Mean Number of Full-Time Employees in Canada	34	55	23	82	48	54	32	30	59	67	49

TABLE IV-3

WHETHER RESPONDENT WORKS AT CANADIAN HEAD OFFICE (Q.1)

BY INDUSTRY SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	65	31	53	67	58	38	85	42	99	52	590
Yes, Works at Canadian Head Office	100%	90%	94%	100%	95%	97%	97%	98%	95%	96%	96%
No, Doesn't Work at Canadian Head Office	0	10	6	0	5	3	3	2	5	4	4

TABLE IV-4

BUSINESS LOCATIONS (Q.3) BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS/ REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	65	31	54	67	59	38	85	42	99	51	591
In the Same City	8%	7%	6%	15%	9%	24%	17%	19%	16%	20%	14%
Elsewhere in Province/ Territory	22	32	19	25	19	26	22	24	19	25	23
Elsewhere in Canada	5	29	13	18	22	24	7	14	13	8	14
In U.S.A.	0	13	2	10	5	3	1	7	4	4	4
Overseas	0	7	0	6	5	0	0	7	3	2	3

TABLE IV-5

TOTAL REVENUES (Q.47) BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	60	28	53	57	52	35	78	37	89	-	489
Less Than $100,000	28%	7%	6%	5%	14%	14%	13%	19%	23%	-	15%
$100,000 to $1 million	50	50	59	40	54	37	41	35	48	-	46
$1 million to $10 million	10	21	26	33	23	31	35	32	23	-	26
$10 million to $50 million	10	18	8	16	8	6	10	8	6	-	9
$50 million to $500 million	2	4	2	5	2	11	1	3	1	-	3
More than $500 million	0	0	0	0	0	0	0	3	0	-	0.2
Median Total Revenues ($000's)	400	700	800	1,800	600	1,000	600	1,000	500	-	800

TABLE IV-6

DISTRIBUTION OF ORGANIZATION'S REVENUE (Q.48)

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	53	26	52	59	52	34	81	34	83	-	474
Local Sales	62%	41%	70%	54%	65%	52%	77%	71%	72%	-	66%
Sales Elsewhere in Province/Territory	20	25	23	17	17	27	18	23	15	-	19
Sales Elsewhere in Canada	8	20	5	17	12	17	4	3	7	-	9
Sales in the U.S.A.	5	2	0	7	5	3	2	1	4	-	3
Sales Overseas	5	12	0	5	1	3	0	2	1	-	2

TABLE IV-7

IMPORTANCE OF LONG DISTANCE TELEPHONE SERVICES TO SUCCESS OF ORGANIZATIONS (Q.4) BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS/ REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	65	31	54	67	59	38	85	42	99	52	592
Very Important	72%	80%	63%	67%	78%	84%	86%	76%	74%	75%	75%
Somewhat Important	22	13	19	22	10	13	6	17	17	21	16
Not Very Important	6	7	17	8	9	3	6	5	4	4	7
Not at All Important	0	0	2	3	3	0	2	2	5	0	2

TABLE IV-8

DISTRIBUTION OF LONG DISTANCE CALLS BY DISTRIBUTION OF CALL (Q.5)

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	65	31	53	66	58	37	83	42	96	51	582
Within Area Code Elsewhere in Province/Territory	63%	49%	69%	64%	65%	54%	67%	71%	63%	77%	65%
Elsewhere in Canada	30	40	29	28	25	37	31	24	29	21	29
In the U.S.A.	5	7	2	6	7	5	2	3	7	1	5
Overseas	1	4	0	2	3	3	0	2	1	1	2

TABLE IV-9

USE OF COMPUTER IN OFFICES (Q.6)

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS/ REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	65	31	54	67	59	38	85	42	99	52	592
Yes, Computer Used	32%	55%	41%	61%	42%	58%	57%	71%	57%	64%	53%
No, Computer Not Used	67	45	59	39	58	42	43	29	43	36	47

TABLE IV-10

TYPES OF COMPUTERS USED (Q.7)[1]

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	21	17	22	41	24	22	48	30	56	32	313
Personal Computers	81%	88%	73%	78%	67%	59%	73%	73%	77%	69%	74%
Minicomputers	29	12	32	31	46	23	40	55	42	33	36
Mainframes	29	12	9	34	13	70	32	28	36	52	33

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[1] Asked only of those respondents whose organizations use computers.

TABLE IV-11

AREAS OF COMPUTERIZATION IN ORGANIZATIONS (Q.8)

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS/ REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	20	17	22	41	24	22	47	29	54	33	309
Accounting	90%	71%	91%	93%	84%	91%	85%	93%	82%	94%	88%
Administration	75	82	77	81	71	82	77	79	83	94	81
Production/Operations	58	59	55	68	68	73	44	59	55	49	57
Inventory Management	50	24	50	56	44	86	69	23	56	39	52
Sales	53	18	46	66	28	77	65	43	38	24	47
Research	5	42	9	20	12	24	16	25	38	30	23

TABLE IV-12

USE OF DATA COMMUNICATIONS (Q.10)[1]

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	20	17	22	41	24	22	48	29	56	32	311
Yes, Use Data Communications	30%	24%	18%	22%	29%	41%	52%	14%	29%	25%	30%
No, Do Not Use Data Communications	70	76	82	78	71	59	48	86	71	75	70

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[1] Asked only of those organizations which use computers.

TABLE IV-13

TYPE OF TELECOMMUNICATIONS SYSTEM USED (Q.23)

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS/ REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	64	30	54	65	59	37	85	42	99	52	587
PBX	5%	13%	7%	14%	15%	14%	20%	21%	19%	19%	15%
Key	9	23	7	11	14	19	26	24	13	15	16
Centrex	2	7	0	3	7	0	1	0	4	4	3

TABLE IV-14

TELECOMMUNICATIONS EQUIPMENT USE (Q.25)

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	65	31	54	67	59	36	84	42	99	52	589
Cellular Telephone Units	14.3%	6.9%	20.4%	15.4%	17.2%	20.0%	5.9%	19.5%	10.3%	17.3%	14.0%
Mobile 2-way Radios	24.6	46.7	37.7	9.1	53.4	26.3	20.0	21.4	26.5	34.6	28.4
Paging Units	16.9	30.0	18.5	34.8	22.4	18.4	29.4	33.3	31.3	34.6	27.3
TWX/Telex Machines	9.2	22.6	18.5	37.3	30.5	39.5	17.6	28.6	25.3	13.5	23.6
FAX Machines	7.7	23.3	13.0	21.5	22.0	13.2	11.8	28.6	16.2	7.7	15.8

TABLE IV-15

TELECOMMUNICATIONS SYSTEMS CHARACTERISTICS (Q.24, 25)[1]

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	65	31	54	67	59	36	84	42	99	52	589
Incoming Lines (Mean)	2.3%	7.4%	3.0%	5.2%	5.1%	3.9%	5.2%	4.9%	9.2%	7.5%	5.5%
Incoming Lines (Median)	2.0	3.0	2.0	3.0	3.0	3.0	2.5	4.0	3.0	3.0	3.0
Cellular Telephone Units (Mean)	15.7	2.0	3.5	7.0	3.8	11.9	3.2	8.1	3.5	8.7	7.0
Cellular Telephone Units (Median)	2.0	2.0	3.0	1.5	2.5	1.0	2.0	3.0	2.5	3.0	2.0
Mobile 2-way Radios (Mean)	6.1	6.4	6.1	5.7	12.5	4.0	4.1	2.2	5.7	9.3	7.0
Mobile 2-way Radios (Median)	6.0	2.5	4.0	5.0	3.0	2.0	2.0	2.0	3.5	5.5	3.0
Paging Units (Mean)	4.4	2.8	2.5	2.0	7.3	2.4	6.9	2.0	7.1	17.7	6.2
Paging Units (Median)	2.0	2.0.	1.5	1.0	2.0	2.0	1.0	1.5	2.0	7.5	2.0
TWX/Telex Machines (Mean)	1.3	1.1	1.0	1.0	1.1	1.1	1.1	1.3	1.4	1.0	1.2
TWX/Telex Machines (Median)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
FAX Machines (Mean)	1.0	1.1	1.0	1.1	1.0	1.0	1.1	1.0	1.3	1.3	1.1
FAX Machines (Median)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

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[1] Means and medians are only for tse organizations with this equipment.

TABLE IV-16

USE OF DEDICATED LINES OR PRIVATE NETWORKS (Q.26)

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	56	31	50	53	56	36	82	40	87	50	541
Yes, Uses Dedicated Lines or Private Networks	11%	23%	20%	19%	14%	28%	24%	25%	25%	30%	22%
No, Doesn't Use Dedicated Lines or Private Networks	89	77	80	81	86	72	76	75	75	70	78

TABLE IV-17

TELECOMMUNICATIONS SERVICES USED (Q.28)

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS/ REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	65	31	54	67	58	38	85	42	99	52	591
Teleconferencing	23%	23%	17%	19%	22%	13%	15%	29%	32%	48%	24%
Public Electronic Mail (e.g. Envoy)	6	7	2	8	9	0	7	2	6	8	6
Data Base Services (e.g. INet)	2	3	4	11	0	3	13	15	15	6	8
Wide Area Telephone Service (WATS)	6	7	9	16	17	24	17	17	9	19	14
Zenith or 800 Service	14	3	32	22	14	32	26	15	30	35	23

TABLE IV-18

PLANNED INCREASE IN THE USE OF TELECOMMUNICATIONS SERVICES (Q.29)

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS/ REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	61	29	51	59	57	35	82	39	94	51	558
Teleconferencing	14%	7%	13%	17%	18%	8%	13%	18%	23%	31%	17%
Public Electronic Mail (e.g. Envoy)	5	4	2	17	9	11	8	5	14	9	9
Data Base Services (e.g. INet)	8	12	4	17	9	15	16	21	24	21	15
Wide Area Telephone Service (WATS)	8	0	10	19	18	21	15	18	11	14	14
Zenith or 800 Service	18	0	14	20	23	20	29	13	20	29	20

TABLE IV-19

TELECOMMUNICATIONS EXPENDITURES (Q.31)

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	61	26	49	54	53	30	76	37	88	44	518
Equipment Expenditure (Mean)	$4,011	$ 1,494	$ 3,713	$ 8,466	$ 4,174	$ 2,557	$10,665	$ 1,651	$ 8,199	$ 7,153	$ 6,039
Service Costs (Mean)	7,217	28,743	13,717	37,000	20,832	14,304	14,745	12,979	22,082	12,805	18,501

TABLE IV-20

DISTRIBUTION OF TELECOMMUNICATIONS OPERATING EXPENDITURES (Q.32)

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS/ REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	59	28	53	62	55	36	85	39	96	51	564
Long Distance Calls	56%	47%	50%	52%	51%	54%	60%	50%	46%	52%	52%
Local Service	38	36	43	38	34	35	31	36	39	43	37
Equipment Rentals	2	12	5	5	11	5	4	3	7	3	5
Leased Private Lines	2	4	1	3	3	3	3	8	4	1	3
Public Carrier Data Networks	0	0	0	0	1	1	2	1	0	0	1
Other	1	1	0	1	1	2	1	2	2	1	1

TABLE IV-21

SIZE OF TELECOMMUNICATIONS COSTS CHANGES (Q. 36)

BY INDUSTRIAL SECTOR

	Industry Sector of Organization																				Total	
	Agr/ For/ Fish		Mining		Const.		Manufac		Trans/ Comm/ P.U.		Whole sale		Retail		Fin/ Ins/ R.E.		Service		Govt/ non profit		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Change in Operating Costs for Leased Private Lines																						
10 to 25% decrease....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0	0	1	1
Less than 10% decrease	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0	0	1	1
About the same........	2	29	7	70	4	57	13	57	5	50	1	14	4	36	4	50	8	38	4	67	52	47
Less than 10% increase	2	29	0	0	1	14	6	26	4	40	2	29	3	27	1	13	4	19	1	17	24	22
10 to 25% increase....	3	43	3	30	2	29	3	13	1	10	3	43	2	18	3	38	5	24	1	17	26	24
26 to 50% increase....	0	0	0	0	0	0	1	4	0	0	1	14	1	9	0	0	1	5	0	0	4	4
More than 50% increase	0	0	0	0	0	0	0	0	0	0	0	0	1	9	0	0	1	5	0	0	2	2
Total................	7	100	10	100	7	100	23	100	10	100	7	100	11	100	8	100	21	100	6	100	110	100
Change in Operating Costs for Public Carrier Data Network																						
26 to 50% decrease....	0	0	0	0	0	0	0	0	0	0	0	0	2	25	0	0	0	0	0	0	2	5
About the same........	2	100	2	100	3	100	10	83	1	25	2	67	3	38	0	0	2	40	2	100	27	61
Less than 10% increase	0	0	0	0	0	0	0	0	0	0	1	33	1	13	1	33	2	40	0	0	5	11
10 to 25% increase....	0	0	0	0	0	0	1	8	1	25	0	0	2	25	2	67	1	20	0	0	7	16
More than 50% increase	0	0	0	0	0	0	1	8	2	50	0	0	0	0	0	0	0	0	0	0	3	7
Total................	2	100	2	100	3	100	12	100	4	100	3	100	8	100	3	100	5	100	2	100	44	100

TABLE IV-21

SIZE OF TELECOMMUNICATIONS COSTS CHANGES (Q. 36)

BY INDUSTRIAL SECTOR (CONTINUED)

	Industry Sector of Organization																				Total	
	Agr/ For/ Fish		Mining		Const.		Manufac		Trans/ Comm/ P.U.		Whole sale		Retail		Fin/ Ins/ R.E.		Service		Govt/ non profit		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Change in Operating Costs for Local Telephone Service																						
More than 50% decrease	0	0	0	0	1	2	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2	0
26 to 50% decrease....	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0
10 to 25% decrease....	1	2	0	0	1	2	0	0	0	0	1	3	1	1	0	0	2	2	2	4	8	1
Less than 10% decrease	0	0	0	0	3	6	1	2	2	4	0	0	0	0	1	3	2	2	0	0	9	2
About the same........	22	36	17	61	23	43	18	30	17	32	11	32	25	33	16	43	30	33	13	28	192	36
Less than 10% increase	10	16	5	18	13	25	15	25	14	26	11	32	13	17	8	22	22	24	19	40	130	24
10 to 25% increase....	26	43	4	14	9	17	24	39	15	28	10	29	30	39	9	24	26	29	6	13	159	29
26 to 50% increase....	1	2	1	4	2	4	1	2	2	4	1	3	2	3	2	5	4	4	5	11	21	4
More than 50% increase	1	2	1	4	1	2	1	2	3	6	0	0	4	5	1	3	4	4	2	4	18	3
Total................	61	100	28	100	53	100	61	100	53	100	34	100	76	100	37	100	90	100	47	100	540	100
Change in Operating Costs for Long Distance Telephone																						
More than 50% decrease	0	0	0	0	0	0	1	2	0	0	0	0	1	1	0	0	0	0	0	0	2	0
26 to 50% decrease....	0	0	1	4	0	0	2	3	0	0	0	0	1	1	0	0	0	0	0	0	4	1
10 to 25% decrease....	0	0	2	8	0	0	0	0	0	0	0	0	3	4	0	0	1	1	1	2	7	1
Less than 10% decrease	0	0	0	0	3	6	4	6	3	6	0	0	0	0	0	0	2	2	1	2	13	2
About the same........	15	27	7	28	22	45	16	26	14	29	11	31	18	23	13	36	44	48	15	33	175	33
Less than 10% increase	14	25	9	36	8	16	10	16	11	23	8	23	8	10	6	17	18	20	16	35	108	21
10 to 25% increase....	24	43	4	16	12	24	26	42	11	23	14	40	32	42	13	36	18	20	8	17	162	31
26 to 50% increase....	2	4	0	0	3	6	2	3	4	8	2	6	9	12	3	8	2	2	4	9	31	6
More than 50% increase	1	2	2	8	1	2	1	2	5	10	0	0	5	6	1	3	7	8	1	2	24	5
Total................	56	100	25	100	49	100	62	100	48	100	35	100	77	100	36	100	92	100	46	100	526	100

TABLE IV-21

SIZE OF TELECOMMUNICATIONS COSTS CHANCES (Q. 36)

BY INDUSTRIAL SECTOR (CONTINUED)

	Industry Sector of Organization																				Total	
	Agr/ For/ Fish		Mining		Const.		Manufac		Trans/ Comm/ P.U.		Whole sale		Retail		Fin/ Ins/ R.E.		Service		Govt/ non profit		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Change in Operating Costs for Telecom. Equipment Rental																						
More than 50% decrease	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	1	11	2	1
26 to 50% decrease....	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	1	1
10 to 25% decrease....	0	0	0	0	0	0	3	12	0	0	0	0	0	0	0	0	1	3	1	11	5	3
Less than 10% decrease	0	0	0	0	0	0	1	4	1	4	0	0	3	13	0	0	0	0	0	0	5	3
About the same........	6	43	8	57	13	87	13	50	15	58	5	56	7	29	2	29	19	58	4	44	92	52
Less than 10% increase	4	29	2	14	0	0	2	8	4	15	2	22	6	25	3	43	5	15	1	11	29	16
10 to 25% increase....	2	14	4	29	1	7	4	15	6	23	1	11	4	17	1	14	7	21	0	0	30	17
26 to 50% increase....	0	0	0	0	1	7	0	0	0	0	1	11	1	4	0	0	1	3	0	0	4	2
More than 50% increase	2	14	0	0	0	0	2	8	0	0	0	0	2	8	1	14	0	0	2	22	9	5
Total.................	14	100	14	100	15	100	26	100	26	100	9	100	24	100	7	100	33	100	9	100	177	100
Change in Capital Costs for Telecommunication Equipment																						
More than 50% decrease	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
10 to 25% decrease....	1	2	0	0	0	0	1	2	0	0	0	0	2	2	0	0	1	1	0	0	5	1
Less than 10% decrease	0	0	0	0	0	0	0	0	1	2	0	0	3	4	0	0	0	0	0	0	4	1
About the same........	40	66	21	75	35	70	42	69	35	67	23	64	47	57	22	65	66	74	30	67	361	67
Less than 10% increase	4	7	1	4	3	6	2	3	2	4	4	11	8	10	5	15	7	8	1	2	37	7
10 to 25% increase....	11	18	4	14	9	18	11	18	9	17	7	19	13	16	5	15	10	11	10	22	89	17
26 to 50% increase....	2	3	0	0	1	2	1	2	0	0	1	3	8	10	1	3	2	2	1	2	17	3
More than 50% increase	3	5	2	7	1	2	4	7	5	10	1	3	2	2	1	3	3	3	3	7	25	5
Total.................	61	100	28	100	50	100	61	100	52	100	36	100	83	100	34	100	89	100	45	100	539	100

TABLE IV-22

WHETHER ORGANIZATIONS RECEIVE GOOD VALUE FOR TELECOMMUNICATIONS EXPENDITURES (Q.37)

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	64	31	50	67	58	35	82	41	97	52	577
Yes, Receives Good Value	86%	94%	86%	93%	79%	89%	84%	90%	89%	83%	87%
No, Doesn't Receive Good Value	14	6	14	7	21	11	16	10	11	17	13

TABLE IV-23

IMPACT OF TELECOMMUNICATIONS ADVANCES AND IMPROVEMENTS UPON ORGANIZATIONS (Q. 38)

BY INDUSTRIAL SECTOR

	Industry Sector of Organization																				Total	
	Agr/ For/ Fish		Mining		Const.		Manufac		Trans/ Comm/ P.U.		Whole sale		Retail		Fin/ Ins/ R.E.		Service		Govt/ non profit		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Impact of Telecommunications on Overall Profitability																						
Very Positive Impact..	6	10	3	11	10	19	6	9	4	7	6	16	8	10	6	15	11	11	1	2	61	11
Positive Impact.......	36	60	9	32	23	43	37	58	34	59	20	54	43	52	17	44	43	45	18	44	280	50
No Impact............	17	28	16	57	21	39	20	31	18	31	11	30	28	34	16	41	40	42	22	54	209	37
Negative Impact.......	1	2	0	0	0	0	1	2	2	3	0	0	4	5	0	0	2	2	0	0	10	2
Total.................	60	100	28	100	54	100	64	100	58	100	37	100	83	100	39	100	96	100	41	100	560	100
Impact of Telecommunications on Business/Revenue Growth																						
Very Positive Impact..	5	8	5	17	7	13	7	11	4	7	5	14	3	4	3	8	10	11	1	2	50	9
Positive Impact.......	33	56	8	28	27	50	35	56	29	51	26	70	43	53	17	44	44	47	13	31	275	50
No Impact............	19	32	15	52	20	37	18	29	24	42	6	16	32	40	19	49	39	41	28	67	220	40
Negative Impact.......	2	3	1	3	0	0	2	3	0	0	0	0	3	4	0	0	1	1	0	0	9	2
Total.................	59	100	29	100	54	100	62	100	57	100	37	100	81	100	39	100	94	100	42	100	554	100
Impact of Telecommunications on Geographic Market Expansion																						
Very Positive Impact..	6	10	2	7	0	0	8	13	3	5	6	17	3	4	4	10	6	7	1	3	39	7
Positive Impact.......	17	29	3	11	16	30	19	30	18	32	9	25	19	24	8	20	22	24	8	22	139	26
No Impact............	33	57	21	78	37	70	32	51	35	61	20	56	56	70	29	71	60	65	26	72	349	64
Negative Impact.......	2	3	1	4	0	0	4	6	1	2	1	3	2	3	0	0	4	4	1	3	16	3
Total.................	58	100	27	100	53	100	63	100	57	100	36	100	80	100	41	100	92	100	36	100	543	100

TABLE IV-23

IMPACT OF TELECOMMUNICATIONS ADVANCES AND IMPROVEMENTS UPON ORGANIZATIONS (Q. 38)

BY INDUSTRIAL SECTOR (CONTINUED)

	Industry Sector of Organization																				Total	
	Agr/ For/ Fish		Mining		Const.		Manufac		Trans/ Comm/ P.U.		Whole sale		Retail		Fin/ Ins/ R.E.		Service		Govt/ non profit		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Impact of Telecommunications on Productivity																						
Very Positive Impact..	2	3	4	14	2	4	8	13	8	14	4	11	9	11	4	10	11	11	5	12	57	10
Positive Impact.......	25	42	10	34	23	43	30	47	25	44	23	62	42	51	13	32	42	43	18	42	251	45
No Impact............	30	51	14	48	29	54	24	38	24	42	10	27	29	35	24	59	41	42	19	44	244	43
Negative Impact.......	2	3	1	3	0	0	2	3	0	0	0	0	2	2	0	0	3	3	1	2	11	2
Total................	59	100	29	100	54	100	64	100	57	100	37	100	82	100	41	100	97	100	43	100	563	100
Impact of Telecommunications on Cost Competitiveness																						
Very Positive Impact..	4	7	0	0	3	6	3	5	4	7	4	11	6	7	4	10	4	5	1	3	33	6
Positive Impact.......	16	28	9	32	18	34	28	44	21	37	13	36	31	38	11	28	27	31	6	17	180	33
No Impact............	37	64	18	64	30	57	31	49	31	54	19	53	40	49	25	63	52	60	26	74	309	57
Negative Impact.......	1	2	1	4	2	4	1	2	1	2	0	0	5	6	0	0	3	3	2	6	16	3
Total................	58	100	28	100	53	100	63	100	57	100	36	100	82	100	40	100	86	100	35	100	538	100
Impact of Telecommunications on Office Location																						
Very Positive Impact..	1	2	5	19	3	6	1	2	2	3	2	5	7	9	3	8	5	6	1	3	30	6
Positive Impact.......	8	14	7	26	16	31	18	29	19	33	8	22	26	33	8	21	24	27	9	23	143	27
No Impact............	44	77	13	48	32	63	39	62	36	62	27	73	43	55	27	69	57	64	28	70	346	64
Negative Impact.......	4	7	2	7	0	0	5	8	1	2	0	0	2	3	1	3	3	3	2	5	20	4
Total................	57	100	27	100	51	100	63	100	58	100	37	100	78	100	39	100	89	100	40	100	539	100

TABLE IV-24

WHETHER ORGANIZATION FACES COMPETITIVE DISADVANTAGE DUE TO TELECOMMUNICATIONS COSTS AND SERVICE AVAILABILITY (Q.39, 40)

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	62	28	51	61	56	37	79	42	95	47	558
Yes, Costs Create Competitive Disadvantage	29%	14%	31%	5%	30%	32%	29%	17%	21%	25%	24%
No, Costs Don't Create Competitive Disadvantage	71	86	69	95	70	68	71	83	79	75	76
Yes, Service Availability Does Create Competitive Disadvantage	24%	11%	27%	10%	32%	27%	20%	17%	13%	14%	19%
No, Service Availability Doesn't Create Competitive Disadvantage	76	89	73	90	68	73	80	83	87	86	81

TABLE IV-25

IMPORTANCE OF TELECOMMUNICATIONS COSTS AND SERVICE AVAILABILITY (Q.41, 43)

IN ORGANIZATION LOCATION DECISION

BY INDUSTRIAL SECTOR

	INDUSTRIAL SECTOR										
Telecom Costs	AGR/FOR/ FISH	MINING	CONST.	MANU.	TRANS/COMM/ UTILITIES	WHOLESALE	RETAIL	FIN/INS REAL ESTATE	SERVICE	GOV'T NON-PROFIT	TOTAL
Sample Size	60	31	50	65	59	36	81	38	96	48	564
Very Important	8%	16%	16%	6%	12%	11%	19%	13%	22%	8%	14%
Somewhat Important	18	3	14	17	25	36	15	16	10	17	17
Not Very Important	22	16	30	31	25	28	31	21	24	13	25
Not At All Important	52	65	40	46	37	25	36	50	44	63	45
Service Availability											
Sample Size	59	29	50	63	59	38	79	38	96	49	560
Very Important	20%	17%	32%	19%	22%	26%	30%	32%	20%	15%	23%
Somewhat Important	22	10	24	14	27	26	23	13	19	10	20
Not Very Important	19	21	14	25	24	32	22	11	20	8	20
Not At All Important	39	52	30	41	27	16	25	45	42	65	38

TABLE IV-26

REASONS FOR IMPORTANCE/UNIMPORTANCE OF TELECOMMUNICATIONS COSTS IN LOCATION DECISION (Q. 42)

BY INDUSTRIAL SECTOR

	Industry Sector of Organization																				Total	
	Agr/ For/ Fish		Mining		Const.		Manufac		Trans/ Comm/ P.U.		Whole sale		Retail		Fin/ Ins/ R.E.		Service		Govt/ non profit		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Why Cost Important or Not Important in Locating Organization																						
Important - Need telecom. services/ important to business..........	5	9	3	10	4	9	5	8	8	14	4	12	4	5	3	8	13	14	2	4	51	9
Important - Cannot afford high cost/ important to save money..............	0	0	0	0	3	6	3	5	3	5	1	3	7	9	1	3	3	3	2	4	23	4
Important - Always an important consideration in business..........	5	9	0	0	1	2	4	6	0	0	0	0	3	4	1	3	2	2	4	8	20	4
Important - Need long distance links/ located in remote area...............	2	4	0	0	0	0	1	2	3	5	3	9	4	5	2	5	5	5	2	4	22	4
Important - If relocating/ expanding/ changing	0	0	0	0	0	0	0	0	1	2	1	3	2	3	0	0	1	1	0	0	5	1
Important - Established here/ good location......	1	2	1	3	0	0	0	0	1	2	5	15	1	1	1	3	1	1	0	0	11	2
Important - Other reasons............	3	5	1	3	6	13	5	8	9	16	5	15	11	14	2	5	7	7	3	6	52	9
Not Important - Need services regardless of cost...........	2	4	1	3	6	13	2	3	6	10	1	3	7	9	3	8	6	6	4	8	38	7

Note: In the body of these tables, "n" equals the number of responses in each category. Responses are totalled across the row in each industry. However, the total number of respondents (i.e. firms) is shown at the bottom of the table under the "n" column. The percentage calculations shown are based only on the number of respondents. This was done in order to indicate the proportion of firms in each industry responding to each item and thereby provide a more significant comparison to the importance of different reasons across all the industries. Because of multiple responses, the percentages if added downward will exceed 100%.

TABLE IV-26

REASONS FOR IMPORTANCE/UNIMPORTANCE OF TELECOMMUNICATIONS COSTS IN LOCATION DECISION (Q. 42)

BY INDUSTRIAL SECTOR (CONTINUED)

	Industry Sector of Organization																				Total	
	Agr/ For/ Fish		Mining		Const.		Manufac		Trans/ Comm/ P.U.		Whole sale		Retail		Fin/ Ins/ R.E.		Service		Govt/ non profit		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Not Important - Local business/ cannot relocate...........	16	28	4	13	14	30	18	28	8	14	6	18	17	22	6	16	14	15	17	35	120	22
Not Important - Other factors more important..........	5	9	8	27	1	2	8	13	7	12	2	6	5	6	5	13	7	7	2	4	50	9
Not Important - Telecom. not important to our business...........	16	28	10	33	8	17	15	23	14	24	7	21	22	28	9	24	25	27	15	31	141	26
Not Important - Comparable costs/services available anywhere.	2	4	3	10	4	9	7	11	4	7	2	6	4	5	5	13	11	12	1	2	43	8
Not Important - Other reasons............	7	12	3	10	9	19	11	17	7	12	3	9	13	16	5	13	13	14	6	13	77	14
Total.................	57		30		47		64		58		34		79		38		94		48		549	

Note: In the body of these tables, "n" equals the number of responses in each category. Responses are totalled across the row in each industry. However, the total number of respondents (i.e. firms) is shown at the bottom of the table under the "n" column. The percentage calculations shown are based only on the number of respondents. This was done in order to indicate the proportion of firms in each industry responding to each item and thereby provide a more significant comparison to the importance of different reasons across all the industries. Because of multiple responses, the percentages if added downward will exceed 100%.

TABLE IV-27

REASONS FOR IMPORTANCE/UNIMPORTANCE OF TELECOMMUNICATIONS SERVICES AVAILABILITY IN LOCATION DECISION (Q. 44)

BY INDUSTRIAL SECTOR

	Industry Sector of Organization																				Total	
	Agr/ For/ Fish		Mining		Const.		Manufac		Trans/ Comm/ P.U.		Whole sale		Retail		Fin/ Ins/ R.E.		Service		Govt/ non profit		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Why Availability Important or Not in Locating Organization																						
Important - Need telecom. services/ important to business..........	16	28	3	11	11	24	11	17	13	24	8	23	16	21	9	24	19	20	7	14	113	21
Important - Use telecom. services a lot...............	3	5	1	4	1	2	3	5	2	4	1	3	0	0	0	0	2	2	0	0	13	2
Important - Due to cost considerations/profitability..........	0	0	0	0	2	4	3	5	0	0	1	3	7	9	1	3	3	3	1	2	18	3
Important - Need long distance links/ located in remote area...............	0	0	0	0	3	7	0	0	1	2	1	3	1	1	2	5	6	6	3	6	17	3
Important - Only if relocating/expanding..................	0	0	0	0	1	2	0	0	3	5	1	3	4	5	1	3	2	2	0	0	12	2
Important - Availability good in present location	1	2	1	4	1	2	2	3	2	4	2	6	7	9	0	0	1	1	0	0	17	3
Important - Other reasons............	5	9	4	14	15	33	9	14	12	22	7	20	17	22	5	14	9	10	6	12	89	16
Not Important - Needed services currently available here.....	4	7	4	14	2	4	5	8	1	2	1	3	5	6	3	8	7	8	3	6	35	6

Note: In the body of these tables, "n" equals the number of responses in each category. Responses are totalled across the row in each industry. However, the total number of respondents (i.e. firms) is shown at the bottom of the table under the "n" column. The percentage calculations shown are based only on the number of respondents. This was done in order to indicate the proportion of firms in each industry responding to each item and thereby provide a more significant comparison to the importance of different reasons across all the industries. Because of multiple responses, the percentages if added downward will exceed 100%.

TABLE IV-27

REASONS FOR IMPORTANCE/UNIMPORTANCE OF TELECOMMUNICATIONS SERVICES AVAILABILITY IN LOCATION DECISION (Q. 44)

BY INDUSTRIAL SECTOR (CONTINUED)

	Industry Sector of Organization																				Total	
	Agr/ For/ Fish		Mining		Const.		Manufac		Trans/ Comm/ P.U.		Whole sale		Retail		Fin/ Ins/ R.E.		Service		Govt/ non profit		n	%
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Not Important - Local business/ cannot relocate..........	11	19	2	7	8	17	12	19	5	9	4	11	10	13	2	5	15	16	16	33	85	16
Not Important - Other factors more important..........	5	9	10	36	2	4	5	8	2	4	1	3	1	1	1	3	6	6	1	2	34	6
Not Important - Telecom. not important to our business..........	9	16	4	14	7	15	9	14	8	15	4	11	14	18	3	8	16	17	7	14	81	15
Not Important - Can get services anywhere..........	1	2	0	0	1	2	3	5	2	4	3	9	4	5	2	5	9	10	2	4	27	5
Not Important - Other reasons...........	6	11	1	4	10	22	12	19	14	25	3	9	10	13	10	27	11	12	8	16	85	16
Total................	57		28		46		63		55		35		77		37		93		49		540	

Note: In the body of these tables, "n" equals the number of responses in each category. Responses are totalled across the row in each industry. However, the total number of respondents (i.e. firms) is shown at the bottom of the table under the "n" column. The percentage calculations shown are based only on the number of respondents. This was done in order to indicate the proportion of firms in each industry responding to each item and thereby provide a more significant comparison to the importance of different reasons across all the industries. Because of multiple responses, the percentages if added downward will exceed 100%.

APPENDIX V

BREAKDOWN OF BUSINESS USER SURVEY RESULTS BY COMPANY SIZE

TABLE V-1

SAMPLE COMPOSITION BY COMPANY SIZE

Company Size	Number	%
Very Small	206	35
Small	100	17
Medium	155	26
Large	131	22
	592	100

Note: Company size was defined by number of employees, as follows:

	# of Employees
Very Small	1-5
Small	6-10
Medium	11-49
Large	50-500

TABLE V-2

NUMBER OF EMPLOYEES (Q.45) BY COMPANY SIZE

	Number of Full-Time Employees			
	At Location		In Canada	
	Mean	Median	Mean	Median
Very Small	3		3	
Small	7		8	
Medium	20		23	
Large	106		182	

TABLE V-3

WHETHER RESPONDENT WORKS AT CANADIAN HEAD OFFICE (Q.1) BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	206	100	154	130	590
Yes, Works At Canadian Head Office	99%	98%	94%	94%	96%
No, Doesn't Work At Canadian Head Office	1	2	6	6	4

TABLE V-4

BUSINESS LOCATIONS (Q.3) BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	206	100	155	130	591
Has Other Offices At Same City	2%	7%	17%	34%	14%
Has Other Offices Elsewhere in Province	7	13	20	57	23
Has Other Offices Elsewhere in Canada	2	5	13	40	14
Has Other Offices in U.S.A.	1	1	5	13	4
Has Other Offices Overseas	1	2	2	8	3

TABLE V-5

TOTAL 1986 REVENUES (Q.47) BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	185	82	125	97	489
Less Than $100,000	34%	9%	3%	1%	15%
$100,000 - $1 Million	62	65	39	10	46
$1 Million - $10 Million	4	27	52	34	26
$10 Million - $50 Million	1	0	5	40	9
$50 Million - $500 Million	0	0	0	14	3
More Then $500 Million	0	0	1	0	1

TABLE V-6

DISTRIBUTION OF ORGANIZATION'S REVENUE (Q.48) BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	182	81	118	93	474
Local Sales	76%	70%	66%	41%	66%
Sales Elsewhere in Province/ Territory	15	18	20	27	19
Sales Elsewhere in Canada	6	6	9	20	9
Sales in the U.S.A.	3	4	2	6	3
Sales Overseas	1	2	3	6	2

TABLE V-7

IMPORTANCE OF LONG DISTANCE TELEPHONE SERVICES TO SUCCESS OF ORGANIZATIONS BY SIZE (Q.4)

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	206	100	155	131	592
Very Important	68%	71%	79%	87%	75%
Somewhat Important	19	23	14	8	16
Not Very Important	10	5	6	4	7
Not At All Important	4	1	2	1	2

TABLE V-8

DISTRIBUTION OF LONG DISTANCE CALLS BY DISTRIBUTION OF CALL (Q.5) BY ORGANIZATION SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	205	99	151	127	582
Within Area Code Elsewhere in Province/ Territory	67%	67%	64%	58%	64%
Elsewhere in Canada	30	26	29	31	29
In the U.S.A.	3	5	6	8	5
Overseas	0	2	1	3	2

TABLE V-9

USE OF COMPUTERS IN OFFICE (Q.6) BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	206	100	155	131	592
Yes, Computer Used	24%	48%	67%	87%	53%
No, Computers Not Used	76	52	33	13	47

TABLE V-10

TYPES OF COMPUTERS USED (Q.7)* BY SIZE OF FIRM

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	48	48	103	114	313
Personal Computers	79%	77%	63%	80%	74
Minicomputers	21	30	34	46	36
Mainframes	8	15	29	54	33

* Asked only of the 53% of firms using computers.
‾ Multiple answers possible.

TABLE V-11

AREAS OF COMPUTERIZATION IN ORGANIZATION (Q.8) BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	48	46	102	113	309
Accounting	79%	85%	87%	93%	88%
Administration	63	74	81	90	81
Production/Operations	50	54	59	61	57
Inventory Management	42	35	48	66	52
Sales	28	50	45	55	47
Research	9	25	24	27	23

TABLE V-12

USE OF DATA COMMUNICATIONS (Q.10)[1] BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	48	48	101	114	311
Yes, Use Data Communications	8%	17%	25%	48%	30%
No, Do Not Use Data Communications	92	83	75	52	70

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[1] Asked only of those organizations which use computers.

TABLE V-13

TYPE OF TELECOMMUNICATIONS SYSTEMS USED (Q.23) BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	205	100	155	127	587
PBX	3.4%	7.0%	15.5%	40.2%	15.2%
Key	6.8	19.2	20.8	21.4	15.7
Centrex	1.0	1.0	0.6	9.7	2.7

TABLE V-14

USE OF TELECOMMUNICATIONS EQUIPMENT (Q.25) BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	202	100	153	124	579
Have Cellular Phones	6.9%	19.0%	17.0%	17.7%	14.0%
Have Mobile 2-Way Radio	18.5	27.0	32.5	40.6	28.4
Have Paging Units	8.3	17.0	36.8	54.7	27.3
Have TWX/Telex	8.3	12.0	25.7	54.2	23.6
Have Facsmile	2.4	12.0	14.2	41.9	15.8

TABLE V-15

TELECOMMUNICATIONS SYSTEMS CHARACTERISTICS (Q.24,25)[1] BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	206	100	154	129	589
Incoming Lines (Mean)	1.8	2.6	5.6	13.8	5.6
Incoming Lines (Median)	1.0	2.0	4.0	7.0	3.0
Cellular Telephone Units (Mean)	2.4	3.2	5.8	14.8	7.0
Cellular Telephone Units (Median)	2.0	2.0	2.5	2.0	2.0
Mobile 2-Way Radios (Mean)	2.8	3.4	10.4	8.9	7.0
Mobile 2-Way Radios (Median)	2.0	3.0	4.0	5.5	3.0
Paging Units (Mean)	1.8	3.9	4.2	9.5	6.2
Paging Units (Median)	1.0	1.0	1.0	2.5	2.0
TWX/Telex (Mean)	1.0	1.0	1.2	1.2	1.2
TWX/Telex (Median)	1.0	1.0	1.0	1.0	1.0
Facsimile Machines (Mean)	1.0	1.1	1.0	1.1	1.1
Facsimile Machines (Median)	1.0	1.0	1.0	1.0	1.0

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[1] Indicates only firms with the above equipment.

TABLE V-16

USE OF DEDICATED LINES OR PRIVATE NETWORKS (Q.26) BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	190	94	144	113	541
Yes, Has Dedicated Lines	9%	15%	25%	45%	22%
OR					
No, Does Not Have Dedicated Lines	91	85	75	55	78

TABLE V-17

TELECOMMUNICATIONS SERVICES USED (Q.28) BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	205	100	155	131	591
Teleconferencing	6%	25%	32%	43%	24%
Public Electronic Mail	2	5	6	12	6
Data Base Services	2	4	15	15	8
WATS	3	8	14	34	14
Zenith or 800 Service	20	24	18	35	23

TABLE V-18

PLANNED INCREASE IN THE USE OF TELECOMMUNICATIONS SERVICES (Q.29) BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	205	100	155	131	591
Teleconferencing	8%	13%	24%	27%	17%
Public Electronic Mail	5	6	8	19	9
Data Base Services	8	9	23	26	16
WATS	5	10	15	30	14
Zenith or 800 Service	18	22	20	23	20

TABLE V-19

TELECOMMUNICATIONS EXPENDITURES (Q.31) BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	192	93	135	98	518
Equipment Expenditure	$ 575	$6,797	$ 3,797	$19,115	$ 6,039
Service Costs	$3,621	$6,508	$15,364	$64,175	$18,501

TABLE V-20

DISTRIBUTION OF TELECOMMUNICATION OPERATING EXPENDITURES (Q.32) BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	203	96	150	115	564
Long Distance Calls	53.4%	52.3%	51.0%	50.9%	52.1%
Local Service	40.4	37.6	36.6	32.3	37.3
Equipment Rentals	3.7	5.4	6.4	7.5	5.5
Leased Private Lines	2.0	2.8	3.6	5.0	3.2
Public Carrier Data Networks	0.0	0.6	0.6	1.2	0.5
Other	0.3	0.5	1.8	2.5	1.2

TABLE V-21

SIZE OF TELECOMMUNICATIONS COSTS CHANGES (Q. 36)

BY COMPANY SIZE (CONTINUED)

	Company Size								Total	
	Very small (1-5)		Small (6-10)		Medium (11-49)		Large (50-500)		n	%
	n	%	n	%	n	%	n	%		
Change in Operating Costs for Leased Private Lines										
10 to 25% decrease............	0	0	0	0	1	3	0	0	1	1
Less than 10% decrease........	0	0	0	0	1	3	0	0	1	1
About the same...............	6	32	6	38	16	48	24	57	52	47
Less than 10% increase........	7	37	4	25	6	18	7	17	24	22
10 to 25% increase............	6	32	4	25	6	18	10	24	26	24
26 to 50% increase............	0	0	2	13	1	3	1	2	4	4
More than 50% increase........	0	0	0	0	2	6	0	0	2	2
Total........................	19	100	16	100	33	100	42	100	110	100
Change in Operating Costs for Public Carrier Data Network										
26 to 50% decrease............	0	0	0	0	1	8	1	5	2	5
About the same...............	1	100	7	70	6	50	13	62	27	61
Less than 10% increase........	0	0	1	10	2	17	2	10	5	11
10 to 25% increase............	0	0	1	10	3	25	3	14	7	16
More than 50% increase........	0	0	1	10	0	0	2	10	3	7
Total........................	1	100	10	100	12	100	21	100	44	100

TABLE V-21

SIZE OF TELECOMMUNICATIONS COSTS CHANGES (Q. 36)

BY COMPANY SIZE (CONTINUED)

	Company Size								Total	
	Very small (1-5)		Small (6-10)		Medium (11-49)		Large (50-500)		n	%
	n	%	n	%	n	%	n	%		
Change in Operating Costs for Local Telephone Service										
More than 50% decrease	2	1	0	0	0	0	0	0	2	0
26 to 50% decrease	0	0	0	0	1	1	0	0	1	0
10 to 25% decrease	2	1	2	2	3	2	1	1	8	1
Less than 10% decrease	2	1	1	1	1	1	5	4	9	2
About the same	70	37	32	36	47	33	43	36	192	36
Less than 10% increase	48	26	22	25	30	21	30	25	130	24
10 to 25% increase	56	30	26	29	44	31	33	27	159	29
26 to 50% increase	5	3	5	6	6	4	5	4	21	4
More than 50% increase	3	2	1	1	10	7	4	3	18	3
Total	188	100	89	100	142	100	121	100	540	100
Change in Operating Costs for Long Distance Telephone										
More than 50% decrease	2	1	0	0	0	0	0	0	2	0
26 to 50% decrease	3	2	0	0	1	1	0	0	4	1
10 to 25% decrease	2	1	2	2	2	1	1	1	7	1
Less than 10% decrease	3	2	2	2	3	2	5	4	13	2
About the same	68	38	28	31	49	35	30	25	175	33
Less than 10% increase	34	19	25	28	22	16	27	23	108	21
10 to 25% increase	51	28	22	25	46	33	43	36	162	31
26 to 50% increase	10	6	5	6	9	6	7	6	31	6
More than 50% increase	6	3	5	6	8	6	5	4	24	5
Total	179	100	89	100	140	100	118	100	526	100

TABLE V-21

SIZE OF TELECOMMUNICATIONS COSTS CHANGES (Q. 36)

BY COMPANY SIZE (CONTINUED)

	Company Size								Total	
	Very small (1-5)		Small (6-10)		Medium (11-49)		Large (50-500)		n	%
	n	%	n	%	n	%	n	%		
Change in Operating Costs for Telecom. Equipment Rental										
More than 50% decrease........	0	0	0	0	2	4	0	0	2	1
26 to 50% decrease............	0	0	0	0	0	0	1	2	1	1
10 to 25% decrease............	0	0	2	7	2	4	1	2	5	3
Less than 10% decrease........	3	8	1	4	0	0	1	2	5	3
About the same................	17	46	17	61	20	41	38	60	92	52
Less than 10% increase........	4	11	4	14	9	18	12	19	29	16
10 to 25% increase............	8	22	2	7	10	20	10	16	30	17
26 to 50% increase............	1	3	1	4	2	4	0	0	4	2
More than 50% increase........	4	11	1	4	4	8	0	0	9	5
Total........................	37	100	28	100	49	100	63	100	177	100
Change in Capital Costs for Telecommunication Equipment										
More than 50% decrease........	0	0	0	0	0	0	1	1	1	0
10 to 25% decrease............	2	1	0	0	2	1	1	1	5	1
Less than 10% decrease........	1	1	2	2	0	0	1	1	4	1
About the same................	143	76	62	66	88	64	68	57	361	67
Less than 10% increase........	10	5	5	5	10	7	12	10	37	7
10 to 25% increase............	23	12	14	15	23	17	29	24	89	17
26 to 50% increase............	3	2	7	7	5	4	2	2	17	3
More than 50% increase........	7	4	4	4	9	7	5	4	25	5
Total........................	189	100	94	100	137	100	11[illegible]	100	539	100

TABLE V-22

WHETHER ORGANIZATIONS RECEIVE GOOD VALUE FOR TELECOMMUNICATION EXPENDITURES (Q.37) BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	202	99	148	128	577
Yes	86%	84%	89%	88%	87%
No	14	16	11	12	13

TABLE V-23

IMPACT OF TELECOMMUNICATIONS ADVANCES AND IMPROVEMENTS UPON ORGANIZATIONS (Q. 38)

BY COMPANY SIZE

	Company Size								Total	
	Very small (1-5)		Small (6-10)		Medium (11-49)		Large (50-500)		n	%
	n	%	n	%	n	%	n	%		
Impact of Telecommunications on Overall Profitability										
Very Positive Impact..........	19	10	12	13	20	14	10	8	61	11
Positive Impact..............	99	50	42	44	70	48	69	56	280	50
No Impact....................	76	39	40	42	51	35	42	34	209	37
Negative Impact..............	3	2	1	1	4	3	2	2	10	2
Total........................	197	100	95	100	145	100	123	100	560	100
Impact of Telecommunications on Business/Revenue Growth										
Very Positive Impact..........	21	11	12	13	9	6	8	7	50	9
Positive Impact..............	100	51	36	39	75	52	64	53	275	50
No Impact....................	72	37	43	47	58	40	47	39	220	40
Negative Impact..............	4	2	1	1	3	2	1	1	9	2
Total........................	197	100	92	100	145	100	120	100	554	100
Impact of Telecommunications on Geographic Market Expansion										
Very Positive Impact..........	7	4	8	9	13	9	11	9	39	7
Positive Impact..............	39	21	22	24	38	26	40	33	139	26
No Impact....................	135	72	60	67	86	60	68	56	349	64
Negative Impact..............	6	3	0	0	7	5	3	2	16	3
Total........................	187	100	90	100	144	100	122	100	543	100

TABLE V-23

IMPACT OF TELECOMMUNICATIONS ADVANCES AND IMPROVEMENTS UPON ORGANIZATIONS (Q. 38)

BY COMPANY SIZE (CONTINUED)

	Company Size								Total	
	Very small (1-5)		Small (6-10)		Medium (11-49)		Large (50-500)		n	%
	n	%	n	%	n	%	n	%		
Impact of Telecommunications on Productivity										
Very Positive Impact..........	16	8	11	12	18	12	12	10	57	10
Positive Impact...............	82	42	35	38	69	47	65	52	251	45
No Impact.....................	92	47	47	51	58	39	47	37	244	43
Negative Impact...............	6	3	0	0	3	2	2	2	11	2
Total.........................	196	100	93	100	148	100	126	100	563	100
Impact of Telecommunications on Cost Competitiveness										
Very Positive Impact.	9	5	5	5	11	8	8	7	33	6
Positive Impact...............	60	32	26	28	53	38	41	34	180	33
No Impact.....................	112	60	60	65	70	50	67	56	309	57
Negative Impact...............	6	3	1	1	6	4	3	3	16	3
Total.........................	187	100	92	100	140	100	119	100	538	100
Impact of Telecommunications on Office Location										
Very Positive Impact..........	7	4	8	9	11	8	4	3	30	6
Positive Impact...............	44	24	19	20	46	33	34	28	143	27
No Impact.....................	124	68	66	71	77	55	79	64	346	64
Negative Impact...............	8	4	0	0	6	4	6	5	20	4
Total.........................	183	100	93	100	140	100	123	100	539	100

TABLE V-24

WHETHER ORGANIZATION FACES COMPETITIVE DISADVANTAGE DUE TO TELECOMMUNICATIONS COSTS AND SERVICE AVAILABILITY (Q.39, 40) BY COMPANY SIZE

	Company Size				
	Very Small	Small	Medium	Large	Total
Sample Size	189	94	149	126	558
Yes, Costs Create Competitive Disadvantage	27%	22%	23%	21%	24%
No, Costs Don't Create Competitive Disadvantage	73	78	77	79	76
Yes, Service Availability Does Create Competitive Disadvantage	24	24	16	13	19
No, Service Availability Doesn't Create Competitive Disadvantage	76	76	84	87	81

TABLE V-25

IMPORTANCE OF TELECOMMUNICATIONS COSTS AND SERVICE AVAILABILITY (Q.41,43) IN ORGANIZATION LOCATION DECISION BY COMPANY SIZE

	Company Size				
Telecom Costs	Very Small	Small	Medium	Large	Total
Sample Size	190	97	149	128	564
Very Important	17%	14%	13%	10%	14%
Somewhat Important	13	8	20	24	17
Not Very Important	23	28	30	20	25
Not At All Important	47	50	38	45	45
Service Availability					
Sample Size	191	98	145	126	560
Very Important	24%	31%	22%	18%	23%
Somewhat Important	19	11	22	23	20
Not Very Important	20	22	19	18	20
Not At All Important	36	36	37	41	37

TABLE V-26

REASONS FOR IMPORTANCE/UNIMPORTANCE OF TELECOMMUNICATIONS COSTS IN LOCATION DECISION (Q. 42)

BY COMPANY SIZE

	Company Size								Total	
	Very small (1-5)		Small (6-10)		Medium (11-49)		Large (50-500)		n	%
	n	%	n	%	n	%	n	%		
Why Cost Important or Not Important in Locating Organization										
Important - Need telecom. services/ important to business	19	10	9	9	12	8	11	9	51	9
Important - Cannot afford high cost/ important to save money	7	4	3	3	8	6	5	4	23	4
Important - Always an important consideration in business	5	3	1	1	5	3	9	7	20	4
Important - Need long distance links/ located in remote area	9	5	3	3	4	3	6	5	22	4
Important - If relocating/ expanding/ changing	4	2	1	1	0	0	0	0	5	1
Important - Established here/ good location	1	1	0	0	7	5	3	2	11	2
Important - Other reasons	17	9	6	6	15	10	14	11	52	9
Not Important - Need services regardless of cost	8	4	12	13	13	9	5	4	38	7
Not Important - Local business/ cannot relocate	40	22	30	32	28	19	22	18	120	22
Not Important - Other factors more important	15	8	5	5	13	9	17	14	50	9
Not Important - Telecom. not important to our business	61	33	20	21	34	24	26	21	141	26
Not Important - Comparable costs/services available anywhere	12	6	6	6	19	13	6	5	43	8
Not Important - Other reasons	25	14	18	19	15	10	19	15	77	14
Total	185		95		144		125		549	

Note: In the body of these tables, "n" equals the number of responses in each category. Responses are totalled across the row in each size category. However, the total number of respondents (i.e. firms) is shown at the bottom of the table under the "n" column. The percentage calculations shown are based only on the number of respondents. This was done in order to indicate the proportion of firms in each size category responding to each item and thereby provide a more significant comparison to the importance of different reasons across all the size categories. Because of multiple responses, the percentages if added downward will exceed 100%.

TABLE V-27

REASONS FOR IMPORTANCE/UNIMPORTANCE OF TELECOMMUNICATIONS SERVICES AVAILABILITY IN LOCATION DECISION (Q. 42)

BY COMPANY SIZE

	Company Size								Total	
	Very small (1-5)		Small (6-10)		Medium (11-49)		Large (50-500)		n	%
	n	%	n	%	n	%	n	%		
Why Availability Important or Not in Locating Organisation										
Important - Need telecom. services/ important to business..................	37	20	23	24	28	20	25	20	113	21
Important - Use telecom. services a lot.............	4	2	2	2	3	2	4	3	13	2
Important - Due to cost considerations/profitability.........................	6	3	3	3	5	4	4	3	18	3
Important - Need long distance links/ located in remote area......................	10	5	2	2	3	2	2	2	17	3
Important - Only if relocating/expanding.......	2	1	1	1	4	3	5	4	12	2
Important - Availability good in present location.........	5	3	3	3	7	5	2	2	17	3
Important - Other reasons.....	35	19	20	21	18	13	16	13	89	16
Not Important - Needed services currently available here.............	10	5	5	5	11	8	9	7	35	6
Not Important - Local business/ cannot relocate..	25	14	16	17	29	21	15	12	85	16
Not Important - Other factors more important.............	11	6	8	8	5	4	10	8	34	6
Not Important - Telecom. not important to our business..	37	20	9	9	18	13	17	14	81	15
Not Important - Can get services anywhere..........	7	4	5	5	8	6	7	6	27	5
Not Important - Other reasons.	29	16	19	20	19	14	18	15	85	16
Total........................	183		96		139		122		540	

Note: In the body of these tables, "n" equals the number of responses in each category. Responses are totalled across the row in each size category. However, the total number of respondents (i.e. firms) is shown at the bottom of the table under the "n" column. The percentage calculations shown are based only on the number of respondents. This was done in order to indicate the proportion of firms in each size category responding to each item and thereby provide a more significant comparison to the importance of different reasons across all the size categories. Because of multiple responses, the percentages if added downward will exceed 100%.